THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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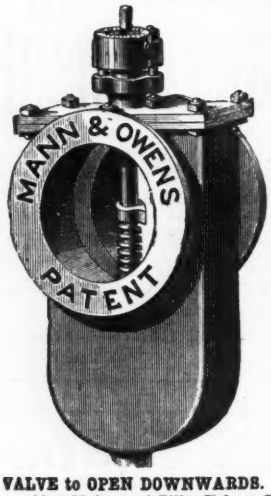

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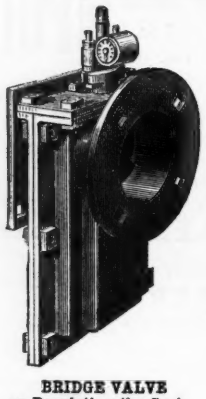

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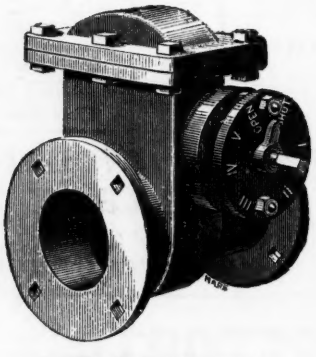

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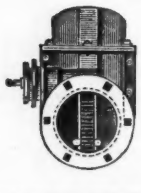

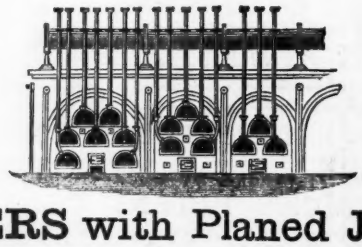

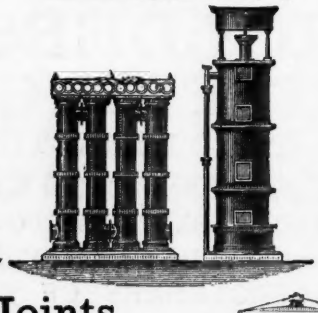

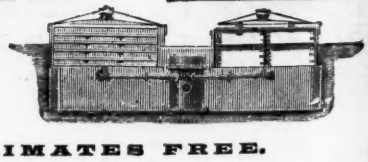

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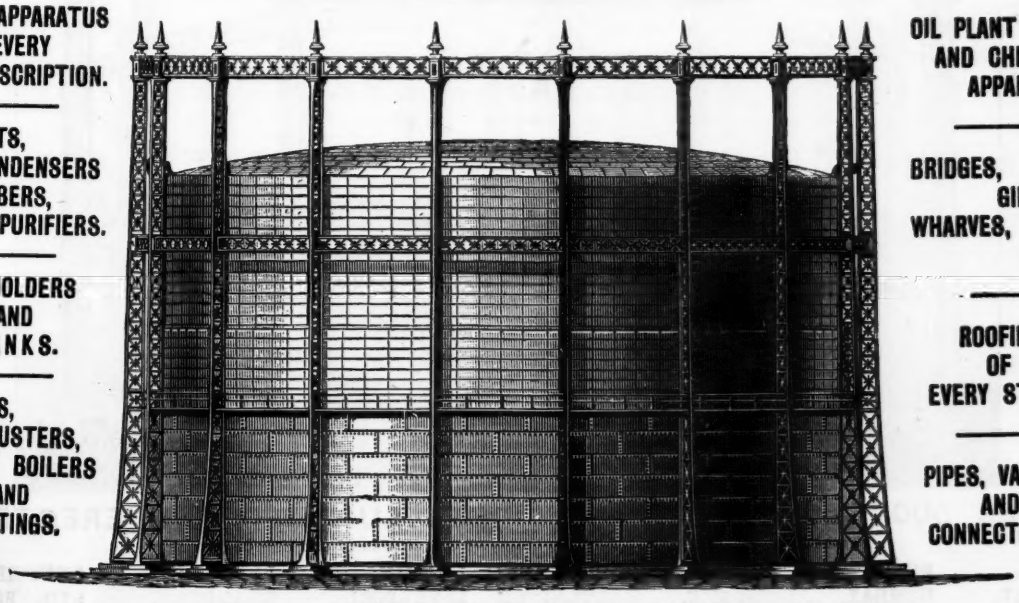

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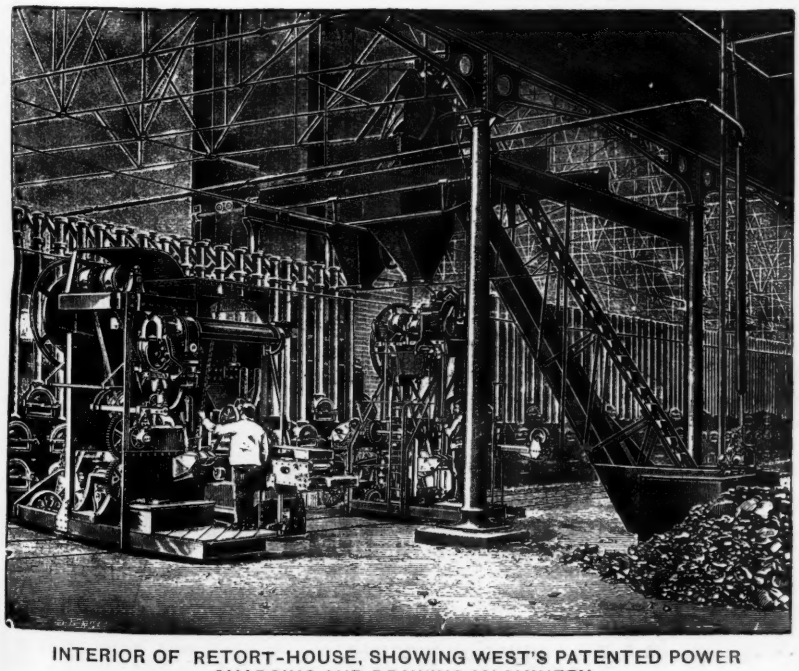

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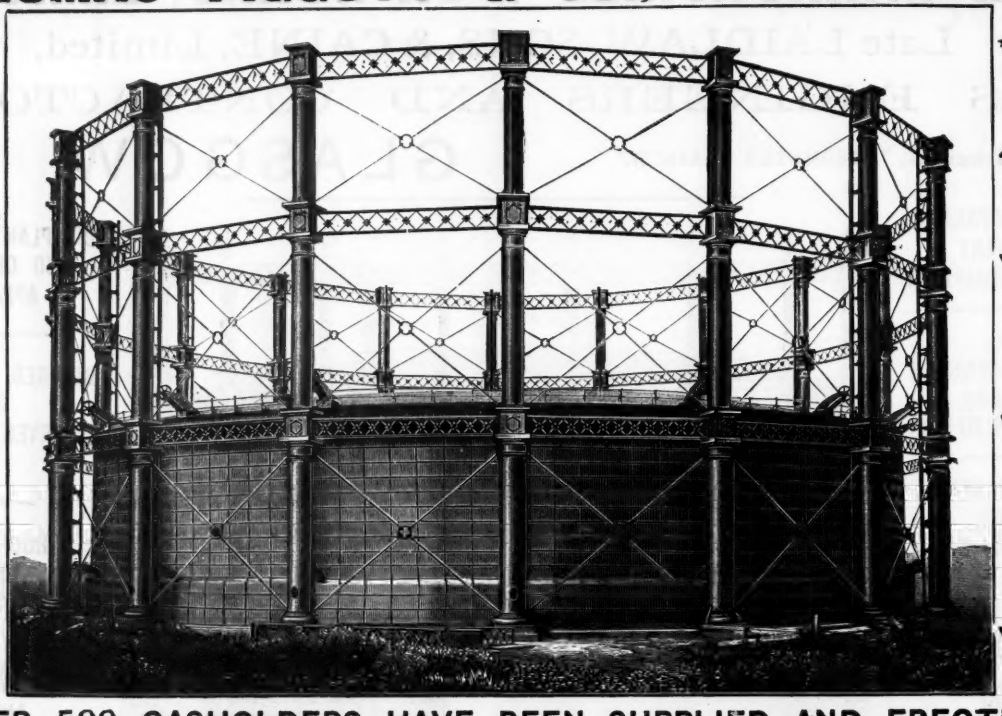

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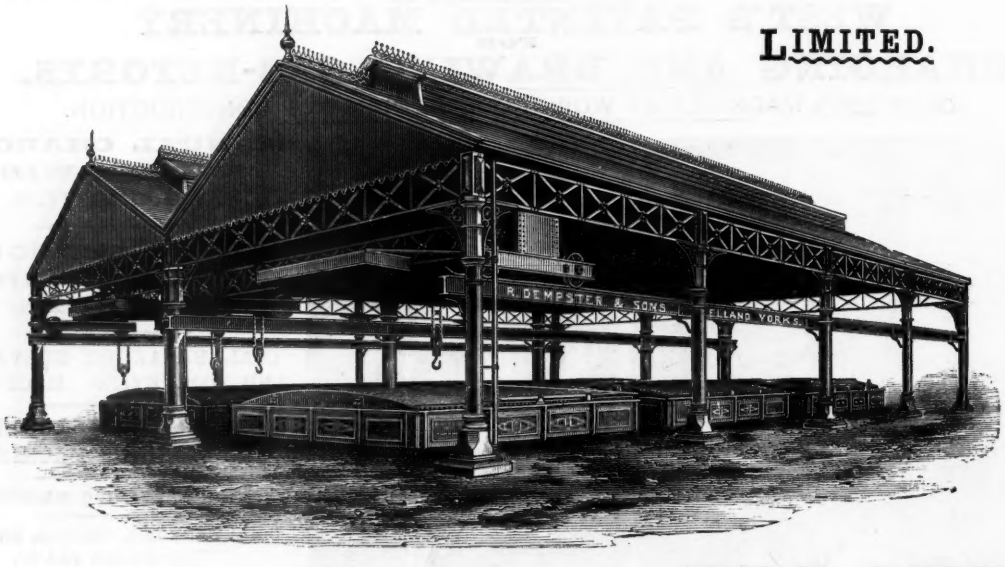

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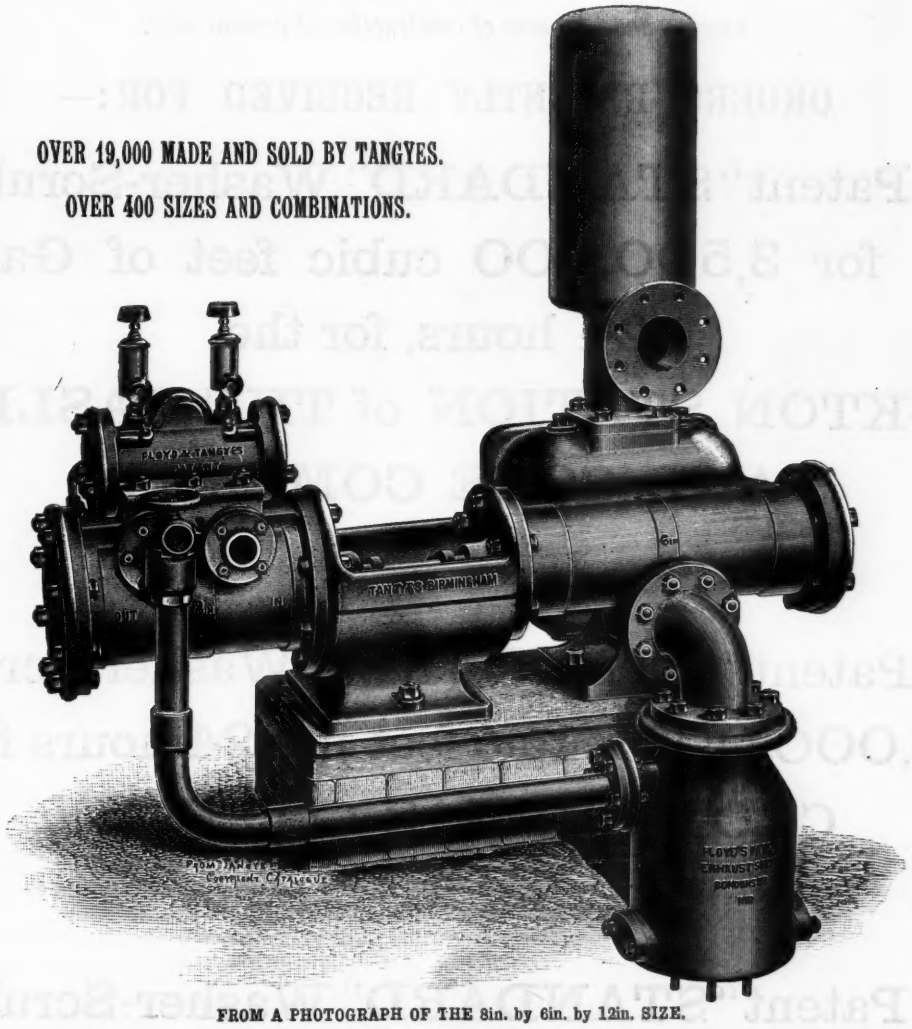

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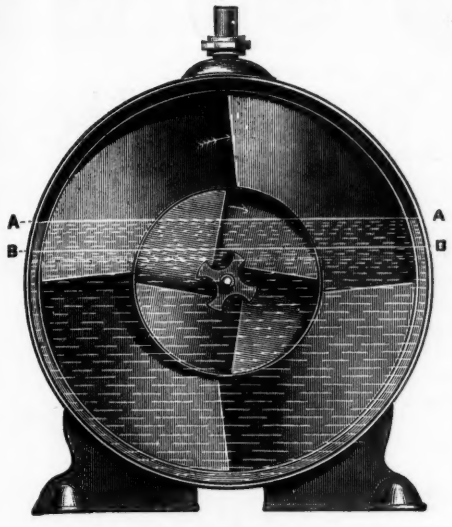
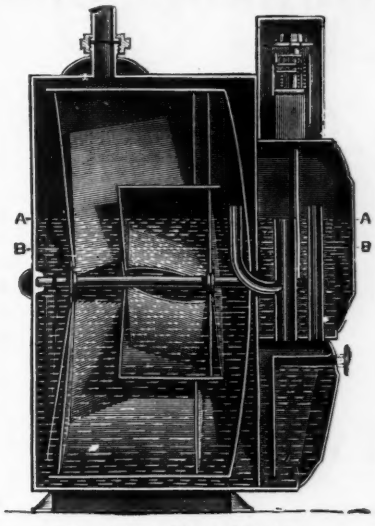


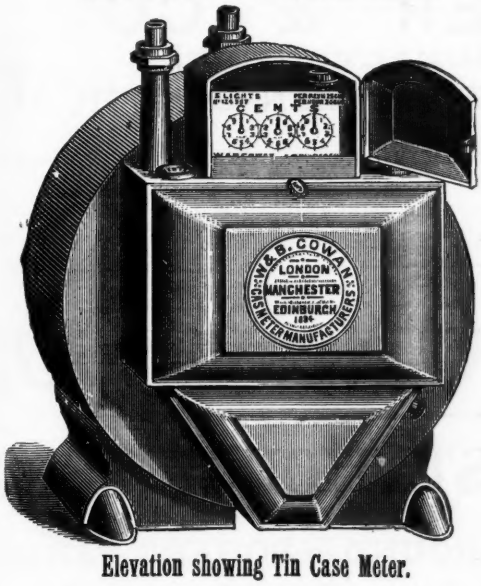
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

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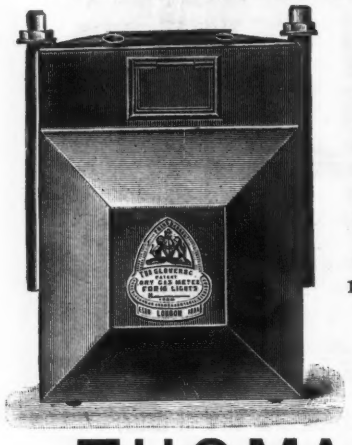

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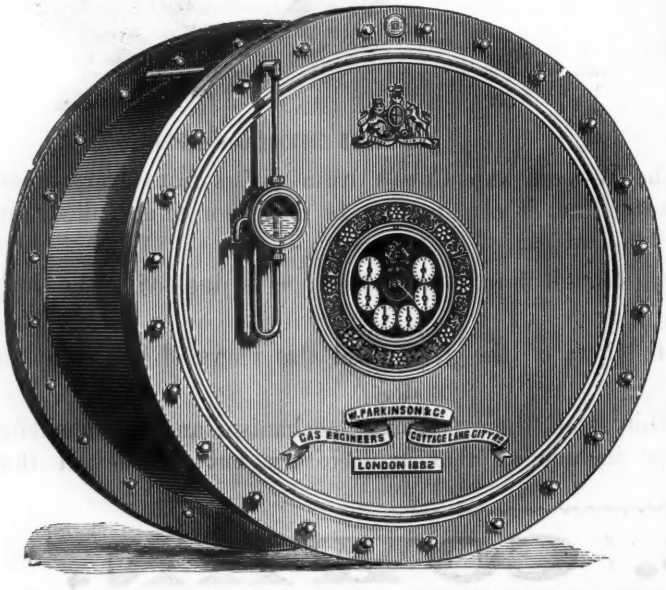

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[See also Advt. p. 648.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 5, 1892.

The Affairs of the Commercial Gas Company.

THE general meeting of the shareholders of the Commercial Gas Company, held last Friday, may be regarded as ending in a triumphant vindication of the policy of the Directors, if these gentlemen choose so to regard proceedings which lasted but a short half hour, and brought them face to face with no criticism, "irresponsible" or otherwise. For it is a lamentable fact that the able Chairman of the Company (Mr. John Blacket Gill) fell into the error which Colonel Makins, M.P., was wise enough to shake off last February—he began his speech to the proprietors with a complaint against "irresponsible criticism." Now, Mr. Gill is far too able and well-instructed a man to need reminding of the nature of the function of critics, whether they deal with the affairs of a gas company or the performance of an artist. This was settled long ago, in his most magisterial manner, by Dr. Johnson, when he maintained that it was not necessary for a man to be a working carpenter to qualify for expressing opinions regarding the workmanship of a table. "A man may know when a "table is well or ill made," said the Doctor, "without being "able to make a better, or even so good a piece of work." And upon the same principle, the sooner Chairmen of Gas Companies put foolish sensitiveness to outside criticism, as such, in their pockets, with their fees, the better they will be enabled to use this criticism as a light for their path. If it is wrongly directed for want of sufficient information, that is hardly the fault of the critic, who has to frame his opinions upon the materials at hand. The great point to be remembered is that the sharper the criticism, provided it is honest, the more salutary it is likely to be; for there is really nothing more poisonous, as well as cloying, than indiscriminating laudation. Who is there to help the administration of a gas undertaking by independent criticism, outside the JOURNAL? Suppose we were to fill our editorial columns week after week with adulation of every director of every gas company in the kingdom, simply because he is a director of a gas company, what conceivable useful purpose would be served thereby? Yet it is according to human nature, we suppose, that no sooner do we call in question, upon common information, the wisdom of a single gas director or public officer, than that individual seizes the first opportunity for declaiming against "irresponsible critics." We had hoped that Mr. Gill was superior to this sort of thing. Now, with regard to Mr. H. E. Jones, the Engineer of the Commercial Gas Company, it is only fair to admit that, whenever he can explain away the point of a published stricture upon his official actions, he generally does so. Referring to the affairs of the Company, we recently took occasion to remark upon the trouble Mr. Jones has had with his coal porters, and inquired why, if the Union hands proved unmanageable, he, as being largely responsible for the supplies of coal to the Commercial works, did not employ others. On Friday, Mr. Jones took, or rather made, an opportunity for explaining that the men whose conduct has been complained of were not under his control, being employed at the Regent's Canal Docks, and not at the gas-works at all. He went on to show, moreover, that these independent members of the coalheaving persuasion were as utterly free from due subjection to their Union officials as to the inferior personages through whom their wages come. This is all very well, so far as it goes. Far be it from us to wantonly throw obstacles in the way of the management of any gas-works, whether in London or elsewhere. We take leave to remind all whom it may concern, however, that the only motive which we can own as governing the comments, favourable or otherwise, upon the conduct of gas undertakings which appear in these columns, is solicitude for the cause of the good management and prosperity of the gas industry as a whole. There are certain gas companies and committees of municipal corporations which just at present appear to us, so inspired, to be in a bad way; and thinking this, for reasons not difficult to be understood, we shall continue to say as much whenever occasion serves. With regard to the Commercial, as in respect of other gas undertakings that could be named, it certainly does appear that the responsible administrators need to have a tighter grip upon the reins. There may not be anything greatly amiss with the property as a whole; but—and we are not now alluding only to the East-end Gas Company—as time goes on and day follows day in strictest routine, there is danger lest at head-quarters the impression should prevail that the concern is able to run itself. In some instances, the prevalence of this impression results in the cutting down of the salaries of principals, the reduction of heads of departments to the status of clerks or foremen, and a general propensity to dispense with brain power in the management. In other cases, the heads emancipate themselves more and more from the care of what they call the details of management, but which are really the bases of commercial prosperity, while they engage in a variety of outside occupations. It is impossible to strictly define the restrictions of good management. But they exist, for all

that; and in matters of gas administration, as in so many others, it is the on-lookers who see most of the way of the game.

The City Gas Examinership.

THE Corporation of the City of London are to be congratulated upon their wise selection of Professor Vivian B. Lewes to fill the vacant gas examinership. There were many highly eligible candidates for the apppointment; and it is with no desire to disparage any of these gentlemen if we venture to express the conviction that in Professor Lewes the City have secured the best man for the post. We say this without reserve, either for personal or professional qualifications. Professor Lewes is not only a capable gas examiner, well trained in that routine which is so necessary in connection with the regular and rigidly impartial discharge of the duties of a statutory office, and for which the brightest attainments or the most brilliant educational record do not compensate the man who does not possess the habitude of it. He is also an enthusiastic worker in the chemistry of the commercial lighting gases; and is certain to make his influence felt on the side of progress in the arts of gas manufacture and utilization. He is, moreover, young, and has a reasonable prospect of many years of professional activity. Wherefore, on all counts, the City Corporation are to be commended on the way in which they have exercised this particular bit of patronage. It is by no means easy for a body of this character to correctly gauge the qualifications of candidates for offices involving the discharge of scientific or technical duties. The average town councillor may reasonably feel puzzled when he is constrained to discriminate between the rival claims of a small host of gentlemen, all apparently equally eminent in their own world, which is a sphere that is usually beyond his own system or that of the associates from whom he derives guidance in ordinary municipal business. Consequently, when such a leading office as that of Gas Examiner to the City of London falls vacant, the incumbent of which can be such an important personage in the little technical world to which he belongs, if his heart is in his work, it is a subject of general concern whether the hazard of the choice will turn out happily or the reverse. This time we sincerely believe, having followed Professor Lewes's recent professional career with considerable interest, that in the office to which he has been elected he will approve himself to be, emphatically, "the right man in the right place."

Gas Companies and Subways.

IN our column devoted to "Parliamentary Intelligence" will be found the condensed report of the conclusion arrived at before Mr. Herbert Gladstone's Committee with regard to the Subways Bill of the London County Council. This measure as first drafted contained some provisions which the owners of the pipes, &c., proposed to be put compulsorily into street subways looked upon with much disfavour. It was not that the Gas Companies and others similarly interested in the matter entertained any particular objection to subways; but what they did not like was the prospect of being saddled with the whole or an unfair proportion of the cost of making these public conveniences, which meanwhile they can very well do without. When the consideration of the Bill was opened in Committee, it speedily appeared that the opposition to its general scope and intent might be composed by arrangement between the parties; and, after several adjournments, during which there was a good deal of negotiation and consultation on all sides respecting the modification of the clauses, these were finally agreed upon. It is not very clear what amount of benefit the Bill, if it passes in its present form, will confer upon the public; but we suppose it means at least that the Gas Companies who have withdrawn their opposition to it are not opposed to the idea of putting their mains into subways and paying a reasonable consideration for the accommodation, such as it is. This agreement may also convince the County Council that Gas Companies have no such malignant desire for breaking up newly-made road surfaces as is sometimes alleged of them. They are ready to fall in with any fair arrangement which may be devised for reducing the annoyance of main and service laying. But this is purely a matter of business with them; and it is only right that, when the placing of gas-mains in street subways is being discussed, it should be clearly understood that these mains and services do not actually need any such treatment, and that, when subways are constructed in the interests of the public, those who derive the greatest benefit should pay the largest share of the expense. Gas Companies have to look very sharply after these things, or else they might often find themselves the victims of those enthusiastic reformers of local affairs who seek so ardently to do good at the expense of others.

Gas at the Chicago Exhibition.

FROM Mr. Alex. C. Humphreys, a well-known member of the profession of gas engineering in the United States, who approaches us in the awe-inspiring official capacity of "Chairman of the Finance Committee of the World's "Fair Gas Industry Council," we have received a letter and a parcel of printed circulars relating to the praiseworthy undertaking of this body to secure fitting representation of the national industry of gas lighting at the Chicago Exhibition of 1893. It appears that, after some trouble, and not a little playing at cross-purposes by those interested in the gas industry and the Exhibition respectively, an allotment of space in the Exhibition grounds has been obtained, whereon it is in contemplation to erect a so-called Gas Building, thereby repeating the example of the Pavilion erected by French Gas Companies at the last Paris Exhibition—of course, with the understanding that the United States are to "go better" in this regard than the Frenchmen. An influential and representative Committee has been formed to take this business in hand, Mr. Eugene Vanderpool being Chairman; and his colleagues are all well known in the profession, not merely in America but throughout the world. Subscriptions from all Transatlantic Gas Companies are being invited; and it is stated that a subsidy after the rate of $4 per million cubic feet of the yearly production of all United States and Canadian Gas Companies would provide the necessary funds. Mr. Humphreys, who is the Secretary of the Permanent Council as well as Chairman of the Finance Committee, has been directed to ask for the co-operation of all the principal Associations of Gas Engineers and Managers in the Old World as well as in the New, with the object of making the Gas Building of Chicago and its contents as complete an exemplification of the gas industry as is possible in the circumstances. And to this end he also bespeaks our good offices. It is with the greatest pleasure that we respond to this appeal. We have too many good friends across the Atlantic to need to be asked twice to say or do anything that is pleasing or helpful in the sight of the duly-accredited representatives of the North American gas industry. We sincerely hope that their participation in their National Exhibition will redound to their credit and to the advantage of the industry; and we can only regret that distance and other material considerations will prevent our sending a Special Commissioner to see how they succeed in their endeavour. At any rate, we can wish Mr. Vanderpool and his associates well through their rather onerous but honourable task. It is to be feared that while United States politicians of both parties are so fond of indulging in the amusement of "twisting the lion's "tail," and while the current economic delusion known as M'Kinleyism embarrasses the commercial relations of the two great English-speaking nations, there will continue to be some difficulty in getting the two peoples to pull together in all matters. In regard to gas engineering, however, there is undoubtedly a bridge of professional sympathy spanning the North Atlantic; and we have every confidence that British gas engineers will extend to their American brethren every assistance they can legitimately afford towards ensuring the success of the Chicago demonstration. It is not for us a question of dollars, but of aid and countenance in other kinds. We should imagine that the loan of models, specimen apparatus, &c., would be acceptable; but, of course, details of this kind can be settled later. The main thing at present is to place British gas engineers in sympathy with their American brethren in respect of the efforts now being put forward by the latter to secure fair recognition at Chicago next year; and to this object we are glad to take the present opportunity of engaging the good offices of all readers of the JOURNAL.

A Trade Union Anniversary.

THE third anniversary of the establishment of the Gas Workers' Union, which was held at Canning Town last

Sunday week, may be regarded as the opening of the Mass-Meeting season of 1892. With the brightening of the days, energetic Trade Union officials furbish up their banners, take their "regalia" out of the safe keeping in which it has reposed through the winter, and inquire after the brassiest of the brass bands which take open-air engagements on Sundays. Poets of a past, and perhaps a more picturesque time, have depicted the effects of Spring, and described how all animate nature responds to the jocund chorus, "Summer is y-comen in!" But it remains for the essentially unpoetical newspaper reporter of this dingy, prosaic age to chronicle how, with the approach of the vernal season, our modern Progressists turn out from the Sunday club-rooms where during the winter they solace themselves with indoor variety entertainments, and make the streets and open spaces of English towns hideous with their tawdry processions. Truly, the reproach of dulness is being fast removed from English Sundays, as observed in many parts of our once Puritanical land. What with our Booths and Burnses, our Thornes and Tilletts, it really seems as if some of us, at any rate, had begun to learn the lesson of keeping the Seventh Day jolly. Let us hope that those classes of the community who follow the new fashion in Sunday Observance enjoy and profit by it. They do little harm, at any rate, by their processionizing and spouting; and if it is any satisfaction, to a man who labours hard all the week, to bedeck himself on Sundays with a gaudy scarf, and carry a heavy banner in a perspiring crowd of his fellows, along a dusty road—well, there is no accounting for tastes. There is something in the suggestion that the undoubted popularity of the mass-meeting and the stump-oration among the less instructed and slowest thinking orders of working men is really due to the lack of ideas in these men, which is shown by their inability to amuse themselves intelligently, or to occupy their leisure hours in any self-suggested employment. It is stated, and we can quite believe it, that the scene of the recent Gas Workers' meeting, as viewed from the centre platform, was very impressive; there being upwards of 20,000 people present, whose demeanour was quiet and orderly, and their attention to the various speakers worthy of all praise. We are told also that there were as many as 90 bands and banners in the procession; and if this report is heavily discounted, it will still prove that there was plenty of noise and colour to fill the ears and take the eyes of the Barking Road crowd. The New Unionism is, as the American phrase goes, "great on banners." If the Gas Workers' Union officials can show little else for the subscriptions of their supporters, it must be a source of deep satisfaction to the latter to reflect that they are currently reputed to possess the "best banners "of any organization in England." Surely, if any of the strikers who were so completely "sold" by the officials on the many occasions which need not be specified here, were present at the recent meeting, the bands and banners would solace them for their sufferings. Be this as it may, it appears reasonable to regard bands and banners in the light of toys which please the grown-up children who assemble in these gatherings, while the speeches they applaud so rapturously must represent the *pabulum* for such general ideas respecting political and social matters as they are able to assimilate. Truly, the spectacle of such a meeting is an impressive one, in a sense different from that in which the word would be used in a newspaper report. Here may be seen masses of the power-wielding English people, swayed by men like Burns and Thorne as hardly a living priest or statesman could hope to sway them. We have nothing whatever to say in this regard against Burns or Thorne, who doubtless act for the best according to their lights. There is manifestly a wide difference between such men and persons like the notorious Michael Henry, or William H. Ward. But how is it that they can count a following, which takes their crudities of thought for ripened wisdom, their wild assertions for gospel, their lop-sided reasoning for comprehensive instruction respecting all things in heaven and on earth? Primarily, as we take it, men of this stamp attain and keep their position because they speak the language of their hearers, and understand better than the learned the mental limitations and emotional springs of the ignorant. Perhaps in the course of time the demagogue may find his occupation gone, because a generation which has been to school will realize that bands and banners do not contain the elements of any sufficient remedy for the "ills that flesh is heir to." But for the time being it is quite evident that the leather-lunged street-corner orator is the darling of the mob; and the community has something to be thankful for in the fact that the majority of these men are "indifferent honest."

WATER AND SANITARY AFFAIRS.

The Royal Commissioners appointed to inquire into the subject of the Metropolitan Water Supply have had two meetings, in order to settle the question of procedure, and to consider the means to be adopted for obtaining the information necessary for the purposes of the inquiry. They come together again to-morrow. As the meetings are a week apart, the apparent rate of advance is not very rapid. The constitution of the Commission seems to have been a little misunderstood by Sir R. Temple, who has asked in Parliament for the addition of one or two Commissioners, who would represent that part of Surrey which suffers—as Sir Richard states—from the circumstance that the River Thames is "being exhausted of all its water" by the Companies. In reply, Mr. Ritchie explained that the Commission had not been formed on the principle of obtaining representatives of the different districts, but of securing the services of gentlemen specially qualified for the important inquiry which the Commission had to undertake. An idea that the Metropolis will demand enough water to drain the whole valley of the Thames, together with that of the Lea, is also represented by a letter which Sir Richard Nicholson has addressed to the London County Council, asking that any new or additional supply should not be taken from within the counties of Hertford, Middlesex, or Surrey, and that any powers granted by Parliament to the Council should be limited accordingly. Mr. H. L. Cripps, the Council's Parliamentary Agent, has discerned a flaw in this proposal, and suggests that, should the Council buy a Water Company's undertaking, payment might have to be made according to the powers possessed by the Company, without reference to the extent to which they were being exercised. If any of these powers were to be subsequently extinguished, who would compensate the Council? It was the conclusion of Mr. Cripps that, pending the report of the Royal Commission, the Councils of the Home Counties should let the matter rest. This statement of the case was embodied in a report laid before the County Council at its meeting last week by the Special Water Committee, and was followed by a trenchant speech from Sir Thomas Farrer, reviewing the position of the Council in reference to the water question. Sir Thomas remarked that the sources of the future water supply of London had not been determined; "and it was obvious that the Home Counties "would have much to say on the subject." In more belligerant tones, the speaker went on to assert that "certain "assumed rights" of the present Companies would be disputed "to the death." Unluckily for the Council, the Government did not see eye to eye with that body on certain parts of the water question, and had required, as a condition of proceeding with the London Water Bill, that the clause should be struck out which was to empower the Council to examine the Companies' books, and otherwise to inquire into their affairs. Sir T. Farrer thought this action on the part of the Government by no means fair. But we presume Mr. Ritchie's idea was that the Royal Commissioners were the proper parties to exercise these extensive powers of investigation. However, Sir Thomas hopes that the County Council will have everything its own way when a new Parliament is elected; and in the meantime he points exultingly to the result of the recent County Council elections in London. The latter result he interprets as an endorsement of the policy adopted at Spring Gardens on the water question. It may be anything else, for aught we know; and it may happen that, when that policy assumes a more definite shape, the ratepayers will take the alarm.

The Hybrid Committee of the House of Commons appointed to consider the Water Bill of the Birmingham Corporation, held their first meeting last Thursday, Mr. Campbell-Bannerman being elected Chairman. The case for the Corporation was opened by Mr. Pope, Q.C., who pleaded that nothing was further from the truth than the assertion that the Birmingham authorities were seeking

to obtain the Elan and Claerwen watershed because they wished to anticipate other people. The present sources of the Birmingham supply gave a minimum yield of some 17½ million gallons per day, and an average of 21 million gallons; whereas the daily demand last year amounted to 17 million gallons, and Mr. Mansergh calculated that 30 million gallons would be required in 1915, rising to 51½ million gallons in 1940. Coming nearer to the present time, it was reckoned that the present supply would be altogether overtaken in 1900, by which date it was expected that the proposed works would be finished. How long it would take the London County Council to make up its mind where to go for fresh supplies, the learned Counsel did not know; and even when the Council had decided the question for itself, other contingencies would intervene to cause delay. Supposing the Royal Commission reported in a manner agreeable to the aspirations of the County Council, giving an utter condemnation to the river supply, a period of years must yet elapse before the Council could begin to appropriate an entirely new source. In the meantime the wants of Birmingham must be met. Put in this manner, Birmingham would seem to have a strong case; and if this can be proved, we do not exactly see what right London has to stand in the way. Topographically, Birmingham comes before the Metropolis in seeking a supply of water from Mid-Wales. If there is water enough in the district for both Birmingham and London, there is the less reason for the latter to make any objection. Probably the County Council will be satisfied if certain clauses, proposed a short time back, are introduced into the Birmingham Bill, so as to secure a water supply for London from Mid-Wales, should it be required. This is all that need be asked for; and we may presume that the supply will never be wanted. Should a Mid-Wales scheme ever be sanctioned for the Metropolis, the cost will be tremendous. The Birmingham Bill asks for power to raise £6,000,000 of capital; and the probability is that all this will be swallowed up, especially if the proposals of the Board of Trade, that the amount of compensation water should be largely increased, are adopted by the Committee. We may observe that the constitution of the Committee has been slightly altered since the names were given last week; Mr. W. James and Sir Henry Stafford Northcote now appearing in the room of Mr. Bryce and Mr. Wharton. In the House of Commons yesterday, Mr. D. Thomas moved that the number of members on the Committee should be increased from nine to eleven, in order that Wales might be duly represented, as largely interested in the inquiry. The proposal found several supporters in the debate which followed; but, on a division, the motion was lost—120 voting for, and 150 against it.

We can hardly pass by an alarming statement quoted in a *Times* leader on Saturday, concerning the unhealthy condition of the rural sanitary district of Staines. The question is raised by a report from Dr. Blaxall, published in the annual volume just issued by the Medical Department of the Local Government Board. The picture given of the rural district referred to is certainly deplorable; and the state of affairs calls for vigorous and prompt correction. We may observe that this is an old story, and Dr. Blaxall's report dates from 1890. It is suggested that the germs of typhoid fever emanating from this miserable region may possibly become mingled with the London water supply. We can only say that there is no evidence of such a result down to the present time. The villagers have cesspools in the gravelly subsoil, and readily succeed in poisoning the local wells. But the intakes at Sunbury are at a considerable distance; and the objection which we find urged is, that there is an underground flow of water in that direction. Supposing this hypothesis to be correct, some allowance is to be made for the natural filtration produced by the intervening gravel-beds, following which is the powerful effect due to the artificial filtration carried out by the Water Companies. The bacteriological examination of the supply by Dr. Koch's process, demonstrates the efficiency of the filtration which the water undergoes after being taken from the Thames; and the vital statistics of the Metropolis give further assurance of the wholesome character of the supply. At the same time, we endorse all that is said as to the extraordinary neglect of the local authorities who have charge of the rural district of Staines, and we trust some remedy will soon be applied.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 637.)

Business in the Stock Markets was even quieter last week than it was the week before. The chief thing was the settlement of the long account; and that went through satisfactorily. But, apart from this, transactions were reduced to the lowest level. Nevertheless, making allowance for this lack of support, the tendency was not at all bad, and prices did not suffer anything to speak of. Money is very easy, and many were prepared for a lowering of the Bank rate on Thursday; but nothing was done. However, it seems bound to fall next Thursday. The Gas Market has been so quiet as to be utterly devoid of feature. There was not a single move made in any issue, either up or down—the only variations being merely *ex div.* corrections; and the scanty array of transactions marked scarcely calls for any notice. Gaslight "A" was dealt in once or twice every day, and showed a disposition to firmness, so far as such slight matter can indicate anything. The closing price on Saturday—216—was the best of the week. The debenture and other secured issues also gave some faint evidence of steadiness. The few transactions recorded in South Metropolitans were at about average figures. The same may be said of Commercials. The Company held their general meeting on Friday; and, for the first time in their history, declared a reduced rate of dividend. This is usually a disagreeable ordeal for a Chairman to go through; but Mr. Gill managed to put the meeting so thoroughly in accord with the Board, that the announcement was actually received with applause. However, 13 per cent. is a very good dividend, and one which we are disposed to think should not again be exceeded in future, except in circumstances at present wholly unforeseen. The Suburban and Provincial Companies and the entire array of Foreign undertakings may be dismissed in one word—stagnation. The isolated transactions marked, however, were at good, steady figures. In the earlier part of the week, there was a moderate amount of business done in Water; but it tailed off to next to nothing towards the end. Some issues which would appear to have been overlooked at the time of the general reduction in values—*e.g.*, Lambeth 7½ per cents. and Southwark and Vauxhall "D"—were put down to a level with the rest; and New River also fell back in line with them. On the other hand, Grand Junction and Southwark and Vauxhall ordinary made a moderate recovery; and Lambeth debentures were quoted *ex div.* at an advance of 2. Taking them all round, the stocks appear to have reached the bottom of their fall, unless some new scare should arise.

The daily operations were too insignificant to require any detailed notice.

The Secretaryship of the Bristol Gas Company has become vacant by the relinquishment by Mr. J. V. Green of the position to which he was appointed on the retirement of Mr. H. H. Townsend early in 1887.

The Gas Referees' Summer Instructions, which have just been issued, contain the notification, usual at this season, that the maximum quantity of sulphur allowable in gas will, until further notice, be 17 grains per 100 cubic feet. Beyond this there is a slight addition to the instructions as to the times and mode of testing gas for illuminating power. In the paragraph in which the candles are described, it is now specified that two candles, "or two of the half candles formed by cutting one of these candles in two," shall be used together; and the three testings conducted on one day are to be made with "three different pairs of candles or half candles." The Instructions bear the name of Arthur W. Rücker (who, as already mentioned in the Journal, has taken Dr. Tyndall's place as one of the Referees), in conjunction with those of Professor A. Vernon Harcourt and Dr. Pole.

South-West of England District Association of Gas Managers.—The next half-yearly meeting of this Association will be held at the offices of the Bristol Gas Company on Tuesday next, under the presidency of Mr. D. Irving. We learn from the notice issued to the members by the Honorary Secretary (Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.) that the following matters will engage attention. After the introductory business has been disposed of, the gentlemen here named will be proposed for election: Mr. W. J. Fuller, Bournemouth; Mr. F. W. Johnston, Stapleton, Bristol; Mr. W. Sainsbury, Salisbury; Mr. S. B. Darwin, Portsea; Mr. G. B. Irons, Gosport. The President will then deliver his Inaugural Address. Three papers are promised for the occasion: (1) "The Construction of the Severn Tunnel," by Mr. C. Richardson, M.Inst.C.E., of Bristol; (2) "The Development of Gas Lighting in Railway Trains," by Mr. E. C. Riley, of Swindon; (3) "The Enrichment of Gas in Bulk by means of Carburettors," by Mr. Frank W. Clark, of London. There will be discussions on these; and one on "The Supply of Gas by Prepayment Meters, or Short-Period Collections, as a means of Increasing Consumption," will be opened by Mr. Geo. J. Gough, of Calne. After the meeting the members and friends will dine at the Royal Hotel; and on the following day a party will visit the Severn Tunnel, by the kind permission of W. Dean, Esq.

ELECTRIC LIGHTING MEMORANDA.

A Popular Statement of the Electric Lighting Question—The Lane-Fox Patent Litigation—The Grosvenor Gallery Station of the Electric Supply Corporation.

A VALUABLE, because reliable series of articles descriptive of the public electric lighting arrangements of London, is being published in the *St. James's Gazette*. It is hardly possible to say anything new about the affairs and prospects of the different Metropolitan Electric Lighting Companies; but the point respecting which public interest is still as keen as ever is the cost of this method of lighting, and how this compares with gas and oil. The *St. James's* articles are not signed; but their author evidently knows what he is writing about, and is equally alive to the circumstances of the consumers' position. In his third article, therefore, he explains in simple language how the price of electric lighting is reckoned. He says: "Just as gas is charged at so much per 1000 cubic feet, so current for electric lighting is charged at so much per Board of Trade unit, or B.T.U. A current of 1 ampère at a pressure of 1 volt is called a watt, and one hour's consumption of such a current is called a watt-hour. The Board of Trade unit is 1000 watt-hours; and its price varies at present from 6d. to 8d." It is explained that the different companies supplying London charge various rates. The maximum permitted by the Board of Trade is 8d. per unit, which is the general price; but the St. Pancras Vestry are trying what can be done at 6d. The writer next gives a statement of the cost of electricity as compared with other sources of light, which will be found in full in another column. These figures are described as resulting from "careful experiments carried out under ordinary household conditions;" and it is remarked of them that they are not likely to "please everybody." This is true, seeing that incandescent electric lamps are shown to cost, for a given amount of lighting, 245s., as compared with 93s. for gas at 3s. per 1000 cubic feet consumed in Argand burners, or 41s. in Wenham lamps, or 30s. in Welsbach incandescent burners. Mineral oil at 7d. per gallon works out, upon the same basis, at from 44s. to 58s., according to the type of lamp employed. We have nothing to complain of in connection with this statement, which errs, if at all, on the side of leniency to the electric light; but we do protest against the writer's conclusion, in another part of his last article, that the public are "well protected" against any danger to life or property from electric light wires. This assertion must have been written before the Chatham catastrophe.

One of those heavy patent cases which are at once the glory of lawyers and the reproach of the legal system of the country, was recently heard by Mr. Justice A. L. Smith, sitting for Mr. Justice Romer. This was the suit of Mr. Lane-Fox, the well-known pioneer of electric lighting, against the Kensington and Knightsbridge Electric Lighting Company, for an alleged infringement of his patent No. 3988 of 1878, which was asserted to cover the idea of utilizing secondary batteries, then newly brought out by Planté, for the purpose of equalizing the supply of current from a central lighting station. The hearing occupied the Court for fifteen days, during which period the unhappy Judge was lectured by all the electrical talent of the country, duly marshalled for the purpose of flatly contradicting one another, and of confusing the Court when they could not succeed in making good their own views. If the plaintiff could have sustained his claim, he would have succeeded to the enviable position of holder of a master patent applying to an important method of electrical distribution; but the event was ordered otherwise. In a judgment, which must be esteemed a marvel of lucidity, especially considering the conflict of evidence from which it was deduced, the learned Judge pronounced the patent cited to be bad, "upon the ground that the complete specification does not conform to the provisional; upon the ground that the invention as described cannot be made to work; and also upon the ground that, if it could, no sufficient information is given as to how it was to be made to work." Perhaps it is not too much to say that this decision may be interpreted in popular language as declaring Mr. Lane-Fox's patent to be a purely speculative one. The patentee seems to have "hit upon an idea," as the phrase goes, which he forthwith proceeded to patent, and which he appears to have believed sufficiently to the point to give him the control over everything that could be done afterwards in this line of invention. This, we may be permitted to observe, is the popularly received notion of "how to make money by patents." The lucky man has his inspiration, for which he obtains protection; and thereafter he is enabled to levy tribute to his heart's content upon the meaner horde of working people who are engaged in making and selling things. It is therefore as well to spread far and wide the correction of such illusions which judgments like this of Mr. Justice A. L. Smith supply. If Chancery proceedings in patent cases teach any general lesson at all, it is that patents for inventions that can be classified in the order of "lucky hits" are rarely of any good in point of law.

It has been reported in the JOURNAL how a firm of tradesmen carrying on business in Bond Street succeeded in obtaining an injunction against the London Electric Supply Corporation, restraining them from using their Grosvenor Gallery premises as a sub-station for receiving and converting high-pressure current from Deptford for use in lighting the district. What the tradesmen in question particularly objected to was the collection, upon premises adjoining their own, of "a large number of electric cables and step-down transformers, which were of a highly inflammatory and combustible nature." That there was good reason for the objection appeared from the fact that there had been two fires upon the premises of the Corporation, the later one being of a very serious character. After the injunction had been obtained, an appeal was entered upon, which naturally led to a settlement, the terms of which are, upon the whole, fair for both parties. With the termination of this litigation, one of the many troubles that beset the path of the Deptford undertaking disappears. It is to be feared, however, that the Corporation have other and more serious obstacles in their course.

The City Gas Examinership.—At the meeting of the Court of Common Council last Thursday, the names of the two gentlemen—Professor Vivian B. Lewes and Dr. Rideal—selected by the Committee from the list of candidates for the appointment of Gas Examiner to the Corporation, were submitted to the Council, and Professor Lewes was elected.

Retort-Scurfing Blocks.—In the course of the second article on "Coal Gas: Its Manufacture, Distribution, and Consumption," which appeared in the JOURNAL for the 22nd ult. (p. 531), reference was made to a plan of scurfing retorts by the aid of fireclay blocks cut a little smaller than the area of the retort. We learn that this system was introduced into the Shrewsbury Gas-Works by Mr. C. B. Newton, of Sheffield, who was formerly Assistant-Manager at those works.

Death of Mr. J. P. Kennedy.—Mr. John P. Kennedy, who died recently in New York City, at the age of 72, was a constructing engineer who had given much attention to the erection of gas-works. In 1861 he put up works for the Metropolitan Gaslight Company of New York, and others in Brooklyn and Detroit. In 1870 he built the works of the New York Mutual Gaslight Company, of which he was Managing Director until 1877, when he was elected President. At the time of his death he was a Director of the Hudson County Gaslight Company.

The Informal Meeting of Scottish Gas Managers.—This meeting will be held in the Victoria Hotel, West George Street, Glasgow, on the 14th inst. As our readers are aware, this is a kind of friendly gathering of members of the former West of Scotland Association; no papers being presented. Mr. James M'Gilchrist, of Dumbarton, is the Convener; and the President this year will be Mr. T. D. Hall, of Montrose, who will deliver an address which will open up discussion, and probably bring out views which may be generally serviceable to the gas industry. The meeting will close, as usual, with a dinner.

The Murdoch Centenary.—Reference has been already made in the JOURNAL to the steps which the North British Association of Gas Managers have taken to celebrate the centenary of William Murdoch, by placing a bust of him in the Wallace Monument at Stirling. At the request of the Memorial Committee of the Association, Mr. A. Murdoch, of Pollokshields, Glasgow, has prepared a sketch of the life and work of his namesake, written in a popular style, with the object of making his genius and achievements more generally known. The book will shortly be ready; and it will be issued at a figure which should ensure its wide circulation among all who are in any way concerned with the gas industry. It will have as a frontispiece a photogravure of Murdoch. Reference to the Murdoch Memorial enables us to correct an error which inadvertently crept into the first paragraph of our "Notes from Scotland" last week. It was on the application of Mr. James M'Gilchrist, of Dumbarton, the Secretary and Treasurer of the Murdoch Memorial Committee of the North British Association (not of Mr. Carlow, the Secretary of the Association), who has from the first taken a very warm interest in the movement, that permission was obtained for placing the bust in the Wallace Monument.

Walker's "Health" Water-Pipe.—Readers of the JOURNAL who are specially interested in the portions of its contents dealing with questions of water supply do not need reminding of the many cases of contamination which have occurred in consequence of water containing properties which make its conveyance through the ordinary lead service-pipes a source of danger to health and life. Attempts have been made to obviate this by special filtration, or by the use of wrought or galvanized iron pipes. These, however, do not exactly meet the requirements, as they are frequently affected by the water, which then deteriorates in value for certain manufacturing operations. With a tin-lined pipe, there is no danger of internal corrosion; and consequently water can be delivered absolutely pure to the consumers. Piping of this kind is now being produced by Messrs. E. Walker and Co., of Mirfield and Heckmondwike; and it is meeting with very favourable consideration in England and abroad. Judging by the sample we have examined, this piping is made of such strength as to stand any pressure without risk of leakage; while a burst would appear to be impossible. Pipes of this kind are made of any required length or diameter; and they are fixed together by tin-lined unions, without the use of lead or other solder.

COMMUNICATED ARTICLE.

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

(*Continued from p.* 532.)

One of the advantages mentioned in the preceding article as being attendant on the adoption of gaseous firing for retorts is the considerable saving of fuel effected thereby. In other words, a gaseous furnace will do the same work as an ordinary furnace, or even more, with (say) from 25 to 30 per cent. less fuel. This is largely due to the fact that the heat which attends the combustion or oxidation of carbon monoxide into carbon dioxide, and which is the heating agent employed in the former class of furnace, is much more intense than that which is derived from the ordinary combustion of coke, and utilized in heating the ordinary settings. In the latter class of furnace, if any carbonic oxide be produced, it is carried forward with other products of combustion, owing to the absence of any secondary air supply; and it may be seen burning with its characteristic pale blue flame at the top of the chimney stack. The heat thus emitted is wholly lost, instead of being conserved and utilized as by the new system.

The construction of generator furnaces has, in the light of recent experiences of practical work, been much simplified of late; and in many works the furnaces are being put up at a cost which, considering the economy and general advantages to be derived from their adoption, will compare most favourably with that of the older form of furnace. It has been authoritatively stated that, where this system is in use, the retorts constructed of fire bricks and tiles do not answer so well as the ordinary moulded retorts, as they are more liable to become deformed by the intense heat acting upon them. To this statement, however, the writer must take exception; holding, as he does, quite the contrary opinion. Nor can it be supported by many managers who are now using well-designed ovens of brick retorts heated by gaseous fuel. The retorts are found to stand the heat well; and the heavy expense that is entailed in the renewal of a setting as compared with the new form of furnace, renders the advantages already claimed for brick retorts (see *ante*, p. 531) even more applicable to settings heated by generator furnaces.

To meet the ever-increasing demand for the minimization of labour in the retort-house, the various applications of machinery, and sundry modern constructive improvements, gas managers are putting in larger retorts than heretofore. We may now consider 16 inches diameter for the circular retort (where it is not displaced by the much more popular ⏢ section), and 21 in. by 15 in. for the latter, as the most economical sizes. Mr. West, however, prefers ⏢ retorts 22 in. by 16 in. where his stoking machinery is to be worked.

Before leaving this subject, the reader should study the remarks of Mr. A. Dougall on the generator furnaces in use at Tunbridge Wells, as given in his Inaugural Address to the Southern District Association of Gas Engineers and Managers at their recent annual meeting (*ante*, p. 484).

Charging Retorts.—Fittings and Connections.

In the majority of gas-works, the charging and drawing of the retorts are done by hand; the former operation being performed by means of the shovel or scoop, the latter with the stoker's rake. The scoop, which is usually worked by three men, deposits half of the charge on one side of the retort first, is then withdrawn, and returned with the second half; the whole being evenly placed over the full length of the retort.

Considerable importance must be attached to the manner in which the charge of coal is laid in the retort, whether by the shovel or the scoop. If the coal be irregularly placed—thin in some parts of the retorts, thick and heavy in others—the rich gases will be driven off from the light portion before the proper time, and gases of low illuminating power that should have been left in the coke will be evolved, to the detriment of the quality of the general bulk of gas. On the other hand, the heavily-laid portion of the charge is not properly spent in the period allowed for distillation; quantities of the illuminating gases remaining in the coke. Moreover, the continued presence of the "uncooked" mass tends to considerably reduce the heat of the retort. Thus much trouble may ensue, both as regards the quality and quantity of the gas obtained, by unskilful or careless charging.

Mechanical Stoking.

Drawing and charging operations should always be carried on as expeditiously as possible. For many years past attempts have been made to economically and satisfactorily substitute machinery—in great part—for hand labour in the retort-house, and many systems of mechanical stoking have been devised and put into practical work with more or less success. The mechanical stokers introduced by Mr. West and Mr. Foulis are those which are best known and most used in England. Mention should also be made of the ingenious invention of Captain Ross, of Cincinnati (U.S.A.).

The system devised by Mr. West commences in the coal-stores adjoining the retort-house. There the coal is reduced by a mechanical breaker to the size best fitted for charging. It is raised by an endless chain of buckets (similar in appearance to the grain-raisers used on board ship in the Baltic grain trade) to a fixed hopper placed at a suitable altitude, immediately above the front of the retort-bench. The charging apparatus consists primarily of a rectangular frame mounted on wheels, which run on tram-rails laid the full length of the retort-house floor. It is readily propelled by a hand wheel or by power to any desired position—either immediately underneath the fixed hopper first referred to, or in front of any of the retorts. At the top of the frame is a smaller hopper, which, when the apparatus is in the right position, can readily be filled with coal from the large stationary one. The discharge at the bottom of this hopper is provided with a spiked spindle, which ensures an even delivery of the coal to the scoops below. Beneath the hopper is a sliding scoop-carrier, which may be raised or lowered at will—a condition of course necessary to meet the several levels of the retorts. The carrier contains twin scoops, and is constructed to run on wheels into the retorts. When there, the scoops are turned over by means of a handle or wheel affixed on the carrier. The whole is then withdrawn, and the retorts are closed. The operation of turning the scoops is similar to that with the hand-worked scoops, except that here, there being two, they are by a train of wheels simultaneously turned over, and the charge is placed by *one* operation instead of by two. The arrangement is an ingenious and a pretty one. The drawing apparatus consists of a kind of light crane, also travelling on wheels on the before-mentioned tram-rails. This carries a rake of somewhat similar pattern to the ordinary hand rake, and supported by a chain and winch fixed to the crane. The rake can be raised, lowered, driven into the retort, and withdrawn by power or by hand as desired.

Power for carrying on the whole of the various operations just described—*i.e.*, preparing and raising the coal, delivering it into the scoops ready for charging, propelling the charging and drawing frames, and manipulating as desired the scoops and rakes—can now, by Mr. West's system, be applied either in part or to all the work. It can be communicated either by a wire rope or other means from a central motor, or by compressed air. The whole of the work done by the West system is simplified to an extent that the early inventors of mechanical stoking would certainly have considered impossible of attainment.

The Foulis system is characterized by the application of hydraulic power to the work of charging and drawing retorts. The power is obtained from an accumulator erected in any convenient position of the works, and fed by pumping-engines of the needful horse power. The accumulator consists essentially of a strongly-built cylinder, in which works a piston, having at its upper end a vessel or other medium for carrying a load that shall give to the piston the pressure required. Through a pipe of small diameter, the cylinder is supplied with water by a pumping-engine. From the cylinder the water is conveyed at the desired pressure to the various positions on the works as needed. The following particulars of his system have been kindly supplied by Mr. Foulis; and they apply to the charging apparatus as well as to the drawing arrangement.

The drawing appliance consists of a steel bar of I section, suspended near its centre to a framework of L iron. On this bar there slides a carriage, which is moved backwards and forwards by two hydraulic cylinders. The rake-rod is attached to this carriage. The bar, together with its hydraulic cylinders, rake-rod, levers, &c., is raised and lowered, to suit the various heights of the retorts, by means of a hydraulic cylinder fixed to the framework. A rope or chain attached to the suspending rope or chain passes upwards and downwards over the pulleys, the end being fixed to a frame. This frame is connected to the rake-bar by a short crank; and to the same shaft that carries the crank is attached a crank which actuates the valve for moving the rake backwards and forwards, and also the handle for traversing the machine. The effect of this arrangement is, first to maintain the rake-bar at the same horizontal level in all positions; and, secondly, to enable the movement for opening the valve, so as to send the rake into the retort, to depress the back end of the I-bar, and so elevate the rake that it passes over the coke—the reverse movement depressing the rake, and withdrawing it from the retort. On the top of the framework is fixed a joint so constructed that the flexible supply-pipes may be speedily connected thereto without either screw or bolts. From this joint ½-inch pipes are led to the hydraulic cylinders; the connections being made by means of a flexible tube, to admit of the rake being raised or lowered. The whole apparatus is controlled from a platform fixed to the back of the machine. The exhaust-pipe is perforated at the front end, in order to discharge some of the water on the rake-rod, and so tend to keep it cool. At the front end of the I-bar is attached a plate, to prevent the coke from being scattered over the floor. Where the bottom retorts are so low that there is not room for this plate, when drawing these retorts it is raised automatically by means of levers and rods actuated by a pulley moving between the L iron bars fixed to the machine. The latter is moved from one retort to another by hand, by means of bevel-wheels and pinions. The quantity of water used is small; the cylinder only being some 1¼ inches in diameter. The time occupied in drawing a retort is only 35 seconds. At Glasgow the retorts are set in beds of eight; and the time occupied in drawing the whole bed, including all movements of raising and lowering the rake-bar and moving the machine from one retort to another, is not more than from six to eight minutes.

Within the past year or two the application of the force of gravitation to the operations of charging and drawing retorts has

received a great impetus owing to the improvements which have been introduced in the setting of inclined retorts by M. Coze. We say "improvements introduced," because the idea of placing retorts at an inclination is not a new one; but it remained for M. Coze to successfully apply the principle to every-day practical use. His system, which is now worked in combination with further improvements under patents of Messrs. Morris and Van Vestraut, has evidently found much favour among some of the leading English gas engineers. It consists essentially of setting the retorts at an angle of 30 degrees, which is found to be the one at which the automatic charging by gravitation can be best obtained. The retorts, set in ovens built back to back, are fed from a central hopper fixed at the top of the bench; and the coal is expeditiously and evenly laid immediately the communication therefrom with the retort is opened. At the lower end of the retort is fixed a screen, against which rests the foremost portion of the charge just run down. The passage of the charge being thus arrested, the coal itself acts as a stop to that above it; and thus the whole charge is quietly brought to rest without a single lump being displaced. At the end of the period of distillation, the lower door is opened, the screen removed, the lower portion of the stratum of coke gently eased off the face of the retort with a chiselled bar, and the spent charge allowed to quietly fall down—the retort being then ready for a fresh charge.

The respective merits of these three systems for dispensing with hand labour cannot be dealt with here. The advantages claimed for all are, however: (1) A higher yield of gas per ton and per mouthpiece; (2) reduction of wear and tear of carbonizing plant; (3) reduction of cost of labour (allowing for wear and tear of machinery); (4) less dependence on hand labour.

Mouthpieces.

The ordinary retort door is a wrought-iron plate, cut to the shape of the retort, and provided with lugs by which to support it on the mouthpiece. The cement or "luting" by which to make the joint tight is put on the door with a trowel, and consists usually of about one part of lime (spent lime from the purifiers will answer very well) and two parts of sand or clay. The door is placed in position, and tightened up by means of a cross-bar and screw fastener. It is an advantage to have the cross-bar hinged on to the mouthpiece, to obviate removing and re-fixing it when a retort is charged and the door put on.

Several good self-sealing retort-lids are in use. Amongst these are Morton's lid with Holman's eccentric fastener, Grice's, Tassie's, Somerville's, and Ruscoe's. Morton's lid, cast to the shape of the mouthpiece, is faced and planed, as is also the latter where the two surfaces will be brought into contact. It is not removable from the retort, but swivels round on opening. It is secured by a catch on the side opposite the swivel hinge, and is tightened up by an eccentric fastening introduced by Mr. Holman. In Grice's lid, the device for self-sealing consists of a groove cast round the edges of the mouthpiece, and a corresponding projection round the lid; both groove and projection being turned in a lathe. Tassie's arrangement is rendered gas tight by a steel ring of circular section, turned true in a lathe, and let into the face of the mouthpiece, against which the lid, which is also faced, is fastened. Both Grice's and Tassie's lids are secured by a screw and cross-bar; and in order to ensure a tight joint, they are made to revolve with the screw. The inventions are thus adapted to circular mouthpieces only.

The mouthpiece is usually secured to the retort by bolts and nuts; the bolts being inserted in the head of the retort prior to the latter being built in. A good cement for ensuring an effective joint with the retort is one-third of iron cement (with excess of sal ammoniac) and two-thirds of fire-clay, well kneaded together to the consistency of dough. (King's "Treatise on Coal Gas.") The bolt-and-nut system of securing mouthpieces is open to serious objection. In the first place, there is the liability of some of the bolts to burn off, thus bringing down the mouthpiece altogether, or throwing an undue and uneven strain on the retort. Secondly, there is the liability of the retorts to give way under the stress of the weight of the mouthpiece and ascension-pipe, unless excessive support be provided to meet this contingency. This difficulty is increased by the introduction of the self-sealing retort-lids and mouthpieces, which, being of a more permanent nature than the older pattern, are also very much heavier. A very good plan, and quite free from any of the objections named, is to brace up the mouthpiece by cross-girders, which are themselves bolted to, and kept in position by, the buckstays, holding together the bench.

Illustrations of mouthpieces, and the auxiliary appliances of the retort-bench, will be found in King's "Treatise on Coal Gas," Vol. I., and in Newbigging's "Handbook" (fifth edition).

Temperature of Coal under Distillation.

Although the coal is distilled at a temperature ranging from 1800° to 1900° Fahr., the gas does not issue from it at this temperature; on the contrary, it is seldom hotter than about 130° Fahr. (Clegg). This is due to the fact that, when solid bodies are converted into the gaseous form, very great absorption of heat occurs. Take, for instance, the conversion of liquid carbonic acid or ammonia into the normal gases. The atmosphere around is so robbed of its heat as to bring the temperature to below zero. The heat of the retorts has thus been absorbed in resolving the solid coal into its gaseous constituents; and these pass off at about the temperature named.

(*To be continued.*)

TECHNICAL RECORD.

NEW ENGLAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting at Boston.

(*Continued from p. 577.*)

At the close of the proceedings following the presentation of the Committee's report on the subject of the representation of the gas industry at the Chicago Exhibition,

Dr. R. Amory (Brookline) gave a description of the new gas and electric light plant recently erected by the Brookline Gas-light Company, which comprises entirely new works built upon marshy ground on the bank of Charles River. The soil consists of mud to an average depth of 30 feet, resting on a quicksand, so that it was necessary to support the whole on piles. The first thing was to erect a retaining-wall along the line of the bank of the river. Piles were driven, connected with cross beams, which support a plank cribbing, on which a stone wall was erected. Outside this wall is a wharf supported on oak piles, fitted with a crane for hoisting coal from vessels alongside, and an automatic railway leading to the coal and lime stores. Piles were next driven for the buildings, tanks, &c.; their tops connected with cross beams and stringers, on which the plank cribbing to receive the stone foundations was placed. The level of the cribbing was so fixed as to allow all the woodwork to be immersed in water for an hour and a half at each tide, and free ingress and egress of the tide water was allowed in all parts. A cellar floor was arranged in all the buildings, at a height of 6 feet above high-water mark, and the working floors were laid at a level of about 17 feet. The intermediate space was utilized for carrying all the gas-pipes and connections. A sufficient number of connecting bridges between the buildings, and also stairways, were erected, to allow of ready and quick access to all parts of the works. Hydraulic elevators were erected for lifting the coal, lime, &c., to the working floors. The coal is raised direct from the lighter into a hopper at the top of a tower, from which it is allowed to fall by gravity into automatic cars, which discharge it into the coal-shed, after passing over a platform weighing-machine. At the lowest part of the coal-shed is a small scale-house, where the coal as required for use can be delivered into hand cars. In these it is transferred, by means of lines of rails and the elevators, direct to the mouths of the retorts. The retort-house is 90 ft. by 63 ft. 6 in., and contains at present six double beds of six retorts in each, or 72 retorts in all, set on half-depth Flemming regenerator furnaces. The working floor forms the stage, and the lower one the coke-cellar; and there is plenty of room for whole-depth regenerators, if it should be found desirable to use them at any future time. There is also a space left sufficient for four more beds, or for a water-gas plant. The coke can be drawn direct into the furnace from the retorts; and the remainder is carried into the boiler-house by means of an endless chain of buckets. A large building, about 120 ft. by 60 ft., contains the whole of the condensing and purifying plant, with annexes forming the meter and governor houses. The plant at present in use at the old station is to be utilized at the new one. From the retort-house the gas is conveyed to the exhausters, then through two condensers, a Walker tar extractor and carbonic acid purifying apparatus, and a "Standard" washer-scrubber, to the purifiers. When complete, there will be eight purifiers, each 18 ft. by 20 ft. In addition to the storeage space for lime, there is a revivifying floor for oxide. The gasholder connections are arranged with bye-passes, admitting of the whole being shut off, or of either inlet or outlet being laid off for cleaning; the other pipe answering both purposes meanwhile. Only one gasholder has been erected; but there is room for two more. Bases have also been left for additional condensers, scrubber, exhauster, and meter. At the present rate of increase, this will provide for the requirements of the next 20 years. The gasholder-tank is constructed of wrought iron. It is supported upon 858 piles, cut off below mean low-water mark, cross timbered, and covered with a double plank floor. On this is a bed of concrete 10 inches thick, upon which was laid an outer ring of concrete 6 feet wide, and on that the iron tank was erected. The centre part was filled up with fine gravel and sand; and after the holder was put in, fine Portland cement was forced into this space by pressure, so as to form a uniform bed of concrete for the support of the tank and holder. The tank is 88 feet in diameter and 22 ft. 3 in. high; and the holder has two lifts. Some difficulty was experienced with the tar and liquor tank, on account of the sea water. Altogether, 165 piles were driven, cut off 4 feet above mean low-water level, cross timbered, and a floor of 3 in. by 10 in. spruce planking laid, as was done for the other buildings. A concrete bed 9 inches thick was put down, and three courses of brickwork in Portland cement, with a cement rendering on the top. A circular brick wall 45 ft. 4 in. in diameter, 7 feet deep, and 2 feet thick, was built on this, also an inner wall 20 feet in diameter and 16 inches thick; the two rings being connected by four radial cross walls. The whole forms one inner tank for tar of 13,000 gallons capacity, and two semi-annular outer tanks, each of 17,000 gallons capacity, for liquor. It was at first attempted to use a cement rendering on the concrete bed; but the tide broke through, and therefore the three courses of brick were added. The electric light plant is contained in a large one-

storey building, 95 ft. by 107 ft., and includes a boiler-room with accommodation for eight nominal 125-horse power boilers. In the engine-room there is space for one 100, one 150, and two 500 horse power engines. The main driving-shaft, to which either or all of the engines can be coupled as required, is supported from an independent foundation. Provision is made for eight 50-light arc dynamos and three 1000-light incandescent dynamos; but this can be extended, if needed, to take two more machines of each kind. Every possible modern improvement has been introduced throughout. The roof is of iron, covered with slate; and to prevent the accumulation of moisture on the iron trusses, &c., they were painted with ground cork and lead paint, laid on to a thickness of ⅛ inch. The ground cork forms a rough surface, something like sand paper, on which water will not condense.

After some questions and conversation on Dr. Amory's paper, the Association proceeded to consider a communication from the Society of Gas Lighting, consisting of a proposition for uniformity in castings. It was read by Mr. Slater. A Committee had been appointed by the Society to devise standard sizes for flanges, sockets, and other connecting parts of gas-pipes, to be used throughout the country, with a view of obviating the inconvenience caused by each maker using special sizes; and the communication, which was illustrated with drawings, set forth the results of their labours. Mr. Harbison proposed that a small Committee should be appointed by the Association, to co-operate with other Associations in getting the recommendations adopted throughout the country. In doing so, he alluded to the advantages which had followed upon the adoption of a similar course in respect to meter couplings a few years since. The proposition was agreed to; and a Committee was appointed to confer with other Associations, and report at the next meeting.

Mr. H. H. Kelly (Waltham, Mass.) read a paper entitled "Wrinkles." The first of these referred to the use of oil as an enricher. A piece of 3-inch wrought-iron pipe, 4 feet long, was filled with broken coke, and two quarts of oil poured into it. One of these cartridges was put into each of two retorts of a bed of six, one hour before drawing. This was found to give time for the gasification of the oil, without exposing the pipe to unnecessary burning. The second "wrinkle" was the use of the best lard oil for the exhauster, which would prevent the formation of pitch. The third recommended the test-cock being fitted on the outlet-pipe rather than on the lid of a purifier; and the fourth, the use of a steel brush 2½ in. by 8 in., as used in foundries for cleaning purifier grids and castings. The fifth "wrinkle" described the use of lime for thawing frozen ground over a gas-main; two bushels of good lime being spread over the place, well wetted and covered with straw and sacking. In a few hours the thaw would penetrate a depth of 18 inches or more. The last "wrinkle" related to soldering meter connections and repairing broken mains. Some discussion followed on the method of thawing frozen ground. Mr. Harbison preferred a fire-basket containing burning coke, as cheaper and quicker in action. Mr. Lamson and Mr. A. C. Humphreys preferred the lime; considering it quite as efficient as coke, while avoiding danger of fire or explosion. Other speakers testified to the superiority of lime for the purpose; and Mr. W. A. Learned described a plan of utilizing steam. He said a small portable boiler was brought up to the spot, some holes drilled into the ground, and steam introduced into them.

The contents of the "question-box" were next considered. The first question asked whether, in the event of a mile of 6-inch main having to be put down, cast or wrought pipe would be used. Mr. F. Egner said it depended on the soil. In a good clay soil, he would lay wrought-iron pipe with screw joints, but in a mixed soil, cast pipes with cement joints, and one lead joint at about every six lengths. He would not trust wrought pipe if ashes were abundant. The wrought pipes could be laid absolutely gas-tight. The services were connected by a band round the main. Mr. A. C. Humphreys said he was not a great believer in wrought pipe, and thought that, by careful working, the leakage from cast pipe could be brought very low. Mr. Harbison said that the duration must be considered. In mixed soil he found that wrought pipes would not last more than 25 years. Mr. Lamson said that wrought-iron pipes might do for outlying districts, but the soil in cities was quite unsuited to them. In reply to an inquiry as to the average yield of tar per ton of coal, 14, 15, 16, 17, and 18 gallons were respectively given by various speakers, as figures based upon a year or more of practical working. Discussing a question about coke, Mr. Egner said that Youghiogheny coal yielded 38 bushels of coke to the ton, and a bushel of the dry coke would weigh 35 to 36 lbs. Some coals yielded as much as 45 bushels, and others as little as 32 bushels per ton. The President said he had made 42 bushels of coke, weighing 38 lbs. to the bushel, per ton of coal carbonized.

A paper entitled "A Gas-Works as a Heat-Engine" was read by Mr. W. E. M'Kay, of Boston. It was based upon observations taken at the Calf Pasture station of the Bay State Gas Company, where carburetted water gas is manufactured by the Flannery process. Attention having been directed to the effect of temperature on the bulk of gas as stored in the holder, the author stated that during September and October last year, 175 million cubic feet of gas were manufactured. The quantity of carbon used in the generator, as shown by the coal introduced *minus* ashes withdrawn, averaged 23·9 lbs. per 1000 cubic feet of gas made. There were 4·8 gallons of naphtha, having a composition of 84 parts of carbon and 16 parts of hydrogen by weight, used for each 1000 cubic feet; and this represented 23·5 lbs. of carbon and 4·5 lbs. of hydrogen. The total carbon used was therefore 47·4 lbs. per 1000 cubic feet of gas made. The gas was 26¾-candle power, and the analysis of it gave the following figures:—

	By Volume.		By Weight.
Carbonic acid	3·2	..	7·2
Illuminants	14·8	..	33·3
Carbonic oxide	25·8	..	36·9
Methane	17·2	..	14·1
Hydrogen	35·6	..	3·6
Nitrogen	3·4	..	4·9
	100·0		100·0

This represents 30 lbs. of carbon, 13·6 lbs. of oxygen, 5·7 lbs. of hydrogen, and 2·5 lbs. of nitrogen in each 1000 cubic feet. According to experiments extended over December and January last, the yield of tar was 0·72 lb. per 1000 cubic feet, which may be taken as 0·6 lb. of carbon and 0·1 lb. of hydrogen. The quantity of steam absorbed is deduced from the oxygen found to be in the gas; 13·6 lbs. of oxygen would represent 15·3 lbs. of steam, and leave 1·7 lbs. of hydrogen to be added to that supplied from the oil. Comparing the weights of carbon and hydrogen supplied with those obtained in the gas tar, there is a deficit of 16·83 lbs. of carbon and 0·41 lb. hydrogen, which represents that burned by the blast in heating up. The carbonic oxide and carbonic acid in the gas contain 9·2 lbs of carbon, which is assumed to come from the coal; and this would leave 14·7 lbs. of carbon to be consumed in the blast. The difference —2·13 lbs.—and the hydrogen, is furnished by the oil; and from this it was calculated that 9·2 per cent. of the oil supplied was used by the blast. Analyses of the blast gases showed a composition of 25·4 parts of carbonic acid, 2·5 parts of carbonic oxide, and 72·1 parts of nitrogen by weight, from which it was shown that all the hydrogen was accounted for, but only 8 lbs. of carbon. The deficit of carbon is deposited in the superheater. The structure of this vessel was considered at length, in regard to the arranging of the brick packing so as to furnish the greatest possible extent of surface for the hot gases from the generator to play upon, and thus retain as much heat as possible. At first using, no secondary supply of air is necessary beyond that in the blast; but afterwards it is desirable to allow a small excess, to burn the carbon off the surface of the bricks. The practical question of the frequency of renewal depended upon the cost of the bricks, as compared with the extent of depreciation they had undergone. At the Calf Pasture works, more than 150 million cubic feet of gas had been passed through a packing of 2600 bricks. The quantity of steam actually supplied to the generator was 31·5 lbs. per 1000 cubic feet of gas, or 16·2 lbs. in excess of that actually used. The temperature of the gas at the superheater outlet was 1616°; at the hydraulic outlet, 192°; at the scrubber inlet, 182°; and after passing the scrubbers, condensers, and a second set of scrubbers, 94°. Reasons were next given for supposing that at the outlet of the superheater there would be 5310 cubic feet of gas, vapour of water, and tar, &c., and 2350 cubic feet at the hydraulic outlet, for every 1000 cubic feet of gas in the holder. By means of full and elaborate calculations, it was shown that the heat lost in cooling and condensation was 56,780 units, of which 45,000 were represented by the water heated in the condensing apparatus; leaving 11,780 units removed by air. There is a copious appendix to the paper, consisting of tables illustrating the various data referred to.

In the course of the discussion, Mr. A. C. Humphreys alluded at length to the importance of properly packing the superheater, so as to get as much baffling of the current as possible; and he also said that the carbon deposit might be reduced or burnt off by leaving the apparatus under natural draught during idle hours. Speaking of water-gas tar, he claimed that if it was properly separated from the water it was more valuable than coal-gas tar. It was found that this was greatly facilitated when water-gas and coal-gas tar were mixed in the same well. Mr. Harbison said he could easily dispose of water-gas tar, and found it very efficient for use as asphalte, or as a paint.

Mr. M'Kay replied at some length; first explaining the difference in the arrangement for packing the superheater, as at present done, and that in the original apparatus. The latter was of a very open character, and was devised at a time when large deposits of carbon had to be dealt with. His tar was of nearly the same specific gravity as water; and when the latter would not separate, the mixture was run into a large tank, holding 16,000 gallons, and heated by a powerful steam coil at the bottom, to nearly the same temperature as the steam. After long heating and thorough cooling, the tar separated out, and there was also a layer of light oil on the surface of the water. The vapours given off during heating could be admitted into the scrubber if desired. The practical advantages of the natural draught for clearing the superheater were very marked; but some care was necessary in adjusting it. The carbon deposit he referred to was not on the surface, but in the substance of the brick itself. The oil he used was a light naphtha (sp. gr. 70 Baumé). He did not state the actual quantity of coal used, because nearly sufficient boiler fuel for the whole of his requirements was obtained from the screenings of the ashes.

(*To be continued.*)

REGISTER OF PATENTS.

Roasting Shelves for Gas-Ovens.—Carr, M. A. St. J., of Old Bond Street, London. No. 18,206; Oct. 23, 1891.

This "invention" consists in making the bars of the grating which supports the meat in a gas-oven while being roasted curve downward at their centres, so that the dripping always runs down to the centre of the bars, where it drops into a dripping-pan placed beneath.

Manufacture of Gas from Hydrocarbon Oils.—Lake, H. H.; communicated from C. H. Wilder, of Boston, U S.A. No. 18,498; Oct. 27, 1891.

This invention relates to the manufacture of gas for illuminating and heating purposes, by vaporizing oil in a retort, and mixing it with heated atmospheric air in an air and vapour mixing retort. The object of the invention is: (1) To provide a novel method or process of feeding oil, or any hydrocarbon liquid, to the vaporizing retort, whereby sediment and other foreign matter contained in the oil is precipitated or deposited prior to the entrance of the oil into the vaporizing retort. (2) To provide a novel method of cleaning or purifying the oil, and subsequently feeding it uniformly to the vaporizing retort, whereby Lima oil can be practically utilized in the manufacture of gas for illuminating and heating purposes, without the residuum in the retorts of offensive odours from the oil-vapour, while obtaining a larger proportion of gas from a given quantity of oil. (3) To provide novel means for feeding the oil to the vaporizing retort, through the medium of hydrostatic pressure on a body of heated water, whereby the oil is not only fed uniformly to the retort, but sediment and other foreign matter is deposited before the oil enters it. (4) To provide a novel apparatus for manufacturing gas by commingling vaporized oil with air.

Self-Closing Gas-Valve and Regulator.—Spratt, C., of New Cross. No. 261; Jan. 6, 1891.

This automatically closing gas-valve consists essentially of a cap dropping over the gas-inlet when the supply is withdrawn, and re-admitting the gas only when acted upon by an exterior pin, lever, or other agent. The means for regulating the amount of gas supplied to the burner, either above or below the self-closing cap, consist of an indented cover fitted on to a similarly indented casing in combination with a ring closing the apertures formed by these indents.

Effecting the Complete Mixture of Inflammable Gas or Vapour with Air.—Vickers, W. E., of Surbiton, and Everett, G. A., of Lincoln's Inn Fields, London. No. 965; Jan. 18, 1892.

This invention relates to apparatus in which ordinary coal gas, or other inflammable gas or vapour, is mixed in such proportions with air that the mixture is permanent and can be used for heating, lighting, and other purposes.

Fig. 1.

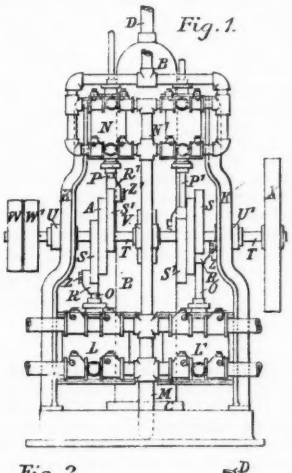


Fig. 2.

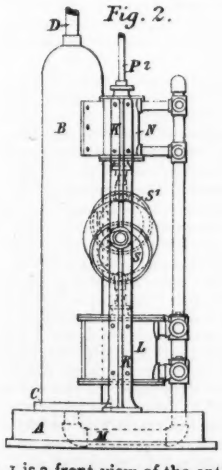


Fig. 3.

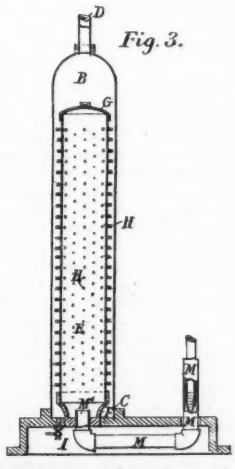


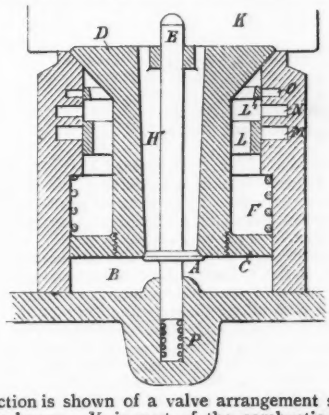
Fig. 1 is a front view of the entire apparatus; fig. 2 is a side view; fig. 3 is a vertical section through the mixing chamber or vessels.

On the base-plate of the apparatus is a tubular chamber B, referably of wrought iron or steel, the lower end of which is fixed upon the base-plate at C. D is a discharge-pipe from the upper end of the chamber B, through which the inflammable mixture is conveyed away to be utilized as may be desired. E is a similar internal chamber or tube of less diameter than, but concentric with B, and carried by a support G, fixed to the base, and having its upper end closed by the cover G. Round the outer circumference of the inner chamber E, are a large number of radial jets H, the outer ends of which approach nearly to the inner side of the outer chamber. These jets are made hollow; their outer closed ends being perforated with small holes directed towards one another, so that the issuing mixture of gas or vapour and air are more thoroughly mixed as they escape. Frames K of cast iron or other suitable material are fixed upon the base, and carry near their lower ends cylinders L L^1, containing pistons by which air is forced into the pipe M, and near their upper ends cylinders N (preferably of smaller size), by which gas or inflammable vapour is also forced into the same pipe. The four cylinders L L^1, and N N^1, are also attached to the outer chamber B. The piston-rods O O^1 pass upward through stuffing-boxes in covers of cylinders L L^1; and the piston-rods P P^1, similarly pass downward through stuffing-boxes in the bottoms of the cylinders N N^1. The outer ends of these four piston-rods are provided with brackets R R^1, fitting against the edges and sides of the four eccentrics S S^1, fitted upon the driving-shaft T, which revolves in bearings U U^1, in the frames K, and in a central bearing V, carried by the chamber B. The shaft is driven by fast or loose pulleys W W^1, or other ordinary devices. The cylinders L L^1 are provided with suction-valves and delivery-valves, and also passages by which air is drawn in through a suction-pipe, and delivered into the pipe M; and the cylinders N N^1 are similarly provided with suction-valves and delivery-valves, by which the gas or inflammable vapour is drawn in through a suction-pipe, and delivered into the gas-delivery pipe. This gas-delivery pipe is of smaller diameter than the pipe M, and passes centrally into the latter through an air-tight junction, and the lower end of the pipe is perforated with a number of small holes (fig. 3), through which the gas is discharged into and mixed with the air delivered into the pipe M from the cylinders L L^1, as already described. The mixture is discharged from the pipe M, into the lower end of the inner chamber E, through the opening M^1 (fig. 3), which may also be provided with a number of perforations, or with wire gauze, instead of having a single opening.

The operation of the apparatus is as follows: The shaft T being set in revolution, the eccentrics S S^1, which have previously been adjusted to the required eccentricity, also revolve; and the pistons in the four cylinders are made to reciprocate with strokes dependent upon the eccentricity of the eccentrics. Air is accordingly forced into the pipe M, and simultaneously gas or inflammable vapour is forced throug the perforations in the gas-delivery pipe into the pipe M. The gas and air become mixed in the pipe, and are then delivered through M^1, into the lower end of the inner chamber E; and the mixture is then forced out through the jets H, becoming further mixed, and striking the inner sides of the chamber B, the mixture (which is then permanent) finally passing out through the delivery-pipe D, and being led away for consumption.

Gas-Engine Valves.—Southall, J., of Worcester. No. 1203; Jan. 21, 1892.

This invention relates to valves for the supply of a suitable mixture of air and inflammable gas or vapour, to the cylinder of a gas-engine, and for the discharge of the products of combustion therefrom.



A central section is shown of a valve arrangement suited for both supply and discharge. K is part of the combustion space of the cylinder, into which opens the valve D. This valve has attached to it at C a collar forming a piston; and at L L^1, rings forming a slide-valve governing three annular ports—M, the exhaust-port, communicating with a discharge-pipe; N, the air-supply port, communicating with the open air; and O, the port for the supply of gas or oil vapour. The valve D, when seated as shown, and subjected to the presence of a helical spring F, has beyond it a space B from which a passage H extends through the body of the valve. This passage is closed by a check-valve A, the stem E of which extends beyond th evalve D into the cylinder space K.

The operation is as follows: When the working piston of the engine is making its outstroke for charging, the valve D lifts enough to allow a passage of air and gas or vapour from the ports N and O, but not enough to uncover the exhaust-port M. When the piston makes its instroke, compressing the charge, the valve D is closed; the valve A being also kept closed by a spring P. The charge being then ignited, the pressure produced in the cylinder causes the valve A to open, and charge the space B with high-pressure fluid. As the piston approaches the end of its outstroke, the pressure in the cylinder is so far reduced that the pressure of the fluid in the space B overcomes the force of the spring F, opens the valve D, and allows the contents of the cylinder to

be discharged by the exhaust-port M; the ports N and O being then covered by L. As the piston approaches the end of its instroke, it (or a part projecting from it meeting the end of the stem E) opens the valve A, and allows the escape of the fluid from the space B; thus permitting the spring F to close the valve D. The space B may communicate with the exhaust-pipe by a passage provided with a valve, which is opened by the governor when the speed of the engine is excessive; thus reducing the pressure in B, and so preventing the valve D from being opened for exhaust until the speed is moderated. The spring P may be so adjusted that the valve A is opened by the pressure of the compressed charge in the cylinder; the space B thus becoming charged with combustible mixture. This being ignited, communicates ignition to the cylinder charge; the valve A being at that time held open by the piston bearing on its stem E.

Shadowless Gas-Lamps.—Hudders, T., of Shaw, Lancs. No. 4508; March 13, 1891.

This invention (designed to prevent the casting of shadows) consists in supporting the top cover or reflector portion of the lamp by small metal bars from the base. These wire supports are secured to the base ring, and extend, at the same time diverging outwards to a convenient height, where they are secured to the top ring, which receives the reflector proper. The inverted cone thus formed by the wire supports, is filled in on the outer diameter by glass segments, so cut and divided as to fit evenly side by side, but not tight, so as to allow for expansion of the glass. The glass segments are held in place as usual by tabs, at the top and bottom. An opening is provided for a ventilator or air cowl.

Treating the Discharge Gases from Gas-Engine Cylinders.—Key, W., of Glasgow. No. 6949; April 22, 1891.

This invention refers to a method of rendering innocuous and inodorous and silencing the explosive discharge and exhaust gases from gas-engine cylinders, by passing them through calcium hydrate or equivalent porous earths or chemical agents within a box or vessel.

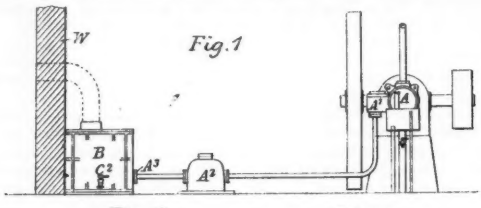


Fig. 1

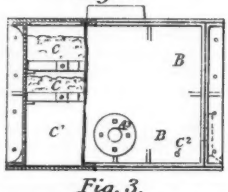


Fig. 2.

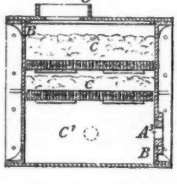


Fig. 4.

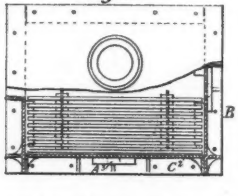


Fig. 3.

Fig. 1 is an elevation of one arrangement of the complete appliances by which these improvements may be carried into practice; fig. 2 is a side view of one construction of the exhaust purifying vessel; fig. 3 is a plan view corresponding to fig. 2; and fig. 4 is a transverse section at right angles to fig. 2.

The improvements consist in leading the discharged gases from the exhaust-port A^1 of the cylinder A of a gas-engine, preferably first through one or more of the usual metallic exhaust-boxes or hollow chambers A^2, and then taking them by another pipe A^3 to, and passing them through, a purifying and noise-silencing box or vessel B, or it may be a tank or chamber. This vessel B is preferably constructed of square or rectangular shape of cast iron or other metal as shown, or of stone, brickwork, cement, or wood; and for a nominal 4-horse power gas-engine might be 2½ feet long by 2 feet broad, and 2 feet high, and be fitted with a portable or removable lid or cover on top, preferably of cast iron, stone, or wood. Horizontal perforated grids or sieves are fitted at distances apart across the chamber B, preferably made of spars of wood, set on edge and resting on projecting flanges or bricks from the inner walls of the vessel, and connected together by transverse bolts and separating collars. The sieves would have filled over them layers C of calcium hydrate of a moist consistency, or equivalent porous earths or chemical agents, to absorb carbonic acid, sulphur, or other impurities from the waste gases passing through them, as well as deadening any sound of explosion. After passing through the material C, they may be discharged through a port or hole in the lid into the engine-room freed from all noxious odours; or the gases thus rendered innocuous and inodorous may be led by a fire-clay or other pipe (shown in dotted lines in fig. 1) through the wall W of the building, and discharged into the outer atmosphere. A series of baffle-bricks, cast-iron grids, or other projections, may be built or fitted with open spaces between them in the lower part C^1 of the interior of the vessel B below the bottom sieve, against which the waste gases or products of combustion would first impinge. Any excess of moisture deposited in the lower part C^1 of the exhaust silencing and purifying vessel B would be discharged by a tap at C^2.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Regulating the Seal in, and Drawing the Tar from, Hydraulic Mains.

Sir,—May I again request the favour of a little space for reply to your correspondents "J. H." and Mr. Ellery on the above subject, in your issues of the 22nd and 29th ult.? The former very persistently maintains that the arrangement described in the Journal of Dec. 16, 1879, and mine are identical; and at this I must once more express my surprise, even after a careful examination of the drawings to which he refers. I do not doubt that the arrangement accomplishes the object intended—*i.e.*, the regulation of the seal and the emptying of the hydraulic main; but these are effected by a very roundabout and expensive means. To regulate the seal of itself is nothing new; and to empty the main by means of an ordinary stop, as is done in the case to which "J. H." refers, is as certainly without novelty. But to regulate the seal, empty the main, and completely shut off communication between the hydraulic main and the run-off pipes by the operation of one and the same screw, and without the use of any stopcock whatever, is most certainly new. This is what I claim, and what is clearly set forth in the specification; and I challenge anyone to prove to me that a vessel accomplishing this threefold object is anywhere in existence.

As to Mr. Ellery's arrangement, a sketch of which he has kindly furnished to me by request, and which he contends is the same as mine "even to some small details," how he could ever come to such a conclusion I fail to make out, as it also is nothing more than a seal-regulator with the addition of a separate stop to empty the main. In the case to which "J. H." refers, the tar is run from the cock into an elevated tank, erected for the purpose of supplying the retort furnaces with tar; while Mr. Ellery has no such arrangement. Now, in my experience, such stopcocks are useless, as they set fast, and cannot be turned when wanted. Hence my device to obviate their use altogether; and if your correspondents will take the trouble to candidly consider the nature and capabilities of their arrangements with mine, I think they will, or should, come to the conclusion that they are wrong, and that their rush into print has been altogether premature.

Paisley, April 1, 1892. Geo. R. Hislop.

The Yield of English and American Gas Coals.

Sir,—In reading the article on "Coal Gas: Its Manufacture, Distribution, and Consumption," published in the Journal for the 8th inst., I am somewhat struck with the statement made in relation to the yield obtained from a ton of Newcastle coal. I have never before this time had an opportunity of knowing what an average Newcastle ton would do; and I confess I am somewhat surprised at the small results obtained. Many of your readers, especially those who are interested in South American and Mediterranean gas-works, may like to know what the coal mined by the Westmoreland Coal Company will do. Some time ago I compiled an average working result from the reports of eleven different large companies, and the yield per ton of 2240 lbs. was 10,864 cubic feet of 17·01-candle gas; the average weight of coke produced being 1596 lbs., and the quantity of tar 13 gallons.

In the article above referred to, it is stated: "Many managers, however, are now constantly getting considerably higher results than the averages just quoted." I should be very glad if you would request the author of the article in question to enlarge upon that point, so that I may have an opportunity of making a fair comparison between the average results produced from American and English gas coals. I have been told that Pelaw Main is a standard coal; and if any of your readers could give me the results produced therefrom, I should esteem it a favour.

E. H. M'Cullough,
President, Westmoreland Coal Company.

Philadelphia (Penn.), March 22, 1892.

Stoking Machinery for the Halifax Gas-Works.—The Gas Committee of the Halifax Corporation are proposing to erect stoking machines at the works under their charge before next winter.

A Water Scheme for Standish.—On behalf of the Local Government Board, Major-General H. D. Crozier, R.E., held an inquiry at Standish last Thursday week, into an application by the Local Board for sanction to borrow £9955 for constructing works for the purpose of obtaining a supply of water from the Chorley reservoir of the Liverpool Corporation. There was no opposition.

Electric Lighting for Leeds.—According to a Leeds contemporary, there is good hope for belief that a public installation of the electric light will be available in the borough in a few months. A Company have been formed under the title of the Yorkshire House-to-House Electricity Company, Limited; and in addition to providing the requisite electric supply for Leeds, they will have, if necessary, the power to supply other parts of the county. At present, however, the Company's enterprise is to be restricted to Leeds. The necessary Provisional Order having been confirmed by Parliament, the Company are raising £50,000 capital in order to lay down works, in connection with which 20,000 lights can be fixed, and mains laid in the most important thoroughfares of the borough. Terms of purchase have been agreed upon in the event of the Corporation wishing to take over the Company's business—the bargain being that the former have power to purchase on giving (roughly) £80,000 in Leeds Corporation 3 per cent. stock for every £50,000 invested in the enterprise. It is estimated that the central supply station will cost (excluding land) £37,500. It will contain three 100,000 watt plants for night working, and one 50,000 watt plant for the day supply. The capacity of the works is calculated to be such as to permit of the wiring for 20,000 8-candle power incandescent lamps, which, on the basis of 11s. per lamp per annum, will, it is expected, bring in a gross revenue to the Company, when the plant is fully employed, of £11,000. Of this amount, the Directors anticipate that fully one-half, or £5500, will be profit.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bill read the first time: East Grinstead Gas and Water Bill.

Opposition withdrawn: Newport Corporation Bill.

Preamble not proved: Llanbradach District and Aber Valley Water Bill.

Bills reported: Oxford Gas Bill; Rhymney Valley Gas and Water Bill; Southborough Local Board (Gas) Bill; Tredegar Local Board Water Bill.

Bills read the third time and passed: Bradford Corporation Water Bill; Liverpool United Gas Bill.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Petition presented for London Water (No. 1) Bill, and Bill subsequently brought in by Sir R. Hanson, Sir C. Hall, Sir J. Lubbock, and Mr. J. Stuart.

Bills read the first time: Barrow-in-Furness Corporation Water Bill; Cleator Moor Local Board (Gas) Bill; London Water (No. 1) Bill.

Bill read a second time and committed: Rhyl District Water Bill.

Bills reported: Brynmawr and Abertillery Gas and Water Bill; Lanarkshire (Middle Ward District) Water Bill; London County Council (Subways) Bill; Ormskirk Gas Bill; Southend Gas Bill.

Bill read the third time and passed: East Grinstead Gas and Water Bill.

Petitions against the following Bills were presented:—

Birmingham Corporation Water Bill, from the Commons Preservation Society, Owners, &c., of Lands in Llansaintffraid Cwmdawddwr and other places, Edward Thomas and others, and Samuel Charles Evans Williams.

London Water (No. 1) Bill, from the County of Middlesex, the Bromley Local Board and the Bromley Rural Sanitary Authority, the East Ham Local Board, and the Conservators of the River Thames.

Petition withdrawn: Stamford Corporation against the Stamford Gas Bill.

HOUSE OF LORDS COMMITTEE.

Friday, March 18.

(*Before Earl* RAVENSWORTH, *Chairman; Viscount* BANGOR, *Lord* WINDSOR, *Lord* ZOUCH OF HARYNGWORTH, *and Lord* SHUTE.)

SWINTON AND PENDLEBURY LOCAL BOARD BILL.

This Bill, under which the Swinton and Pendlebury Local Board seek power to acquire the portion of the gas undertaking of the Salford Corporation situated within the Board's district, as well as in several other places in the outskirts of Salford, under a clause inserted in the Provisional Order obtained by the Corporation last session, came to-day before the above-named Select Committee.

Mr. BIDDER, Q.C., Mr. SAUNDERS, Q.C., and Mr. FREEMAN appeared for the promoters. The Bill was opposed by the Corporation of Salford, for whom Mr. BALFOUR BROWNE, Q.C., and Mr. HANS HAMILTON appeared; by the Barton-upon-Irwell Rural Sanitary Authority, represented by Mr. PEMBROKE STEPHENS, Q.C., and Mr. J. D. FITZGERALD; the Little Hulton Local Board, by Mr. J. BATTEN; and the Barton, Eccles, Winton, and Monton Local Board, by Mr. LITTLER, Q.C., and Mr. RAM. There were other petitioners against the Bill; but no Counsel were in attendance on their behalf.

Mr. BIDDER, in opening the case for the promoters, said the Bill was the outcome of the legislation of last year. The districts of the Local Board of Swinton and Pendlebury, of the Local Board of Barton and Eccles, and of the Barton Rural Sanitary Authority had up to the present time been supplied with gas from the works of the Salford Corporation, whose mains traversed the district. This supply had been eminently unsatisfactory to everybody concerned, both within and beyond the borough, but especially for those outside. The former mismanagement of the Salford Gas-Works had become perfectly notorious; and a Committee of Investigation, appointed to look into the matter, reported that the capital expenditure had been extravagant, that thousands of pounds a year were lost in the working of the undertaking, and that there was no proper supervision. Their Lordships, therefore, would not wonder that, under these circumstances, everybody dependent upon Salford for gas was dissatisfied. But the districts outside the borough had the greatest reason to be discontented, because the Corporation, although they had no express parliamentary power authorizing them to do so, had been in the habit of charging a differential rate for gas. In Swinton, Barton, and Eccles, an additional rate of 4d. per 1000 cubic feet was imposed for the gas, as compared with what was paid in the borough; and in the outer districts, it was 9d. per 1000 feet extra. As, notwithstanding their extravagance of management, the Corporation took large amounts realized by the gas undertaking, and applied them in relief of the rates in the borough, their Lordships would understand that the outlying districts thought it a monstrous thing that they were being charged so high a rate for their gas, and that big profits were obtained from them in order to relieve the inhabitants of Salford of their rates. This was the state of things when last year the Salford Corporation applied to the Local Government Board for a Provisional Order, to enable them to raise further capital for the extension of their gas-works. Thereupon the Swinton and Pendlebury Local Board and the Local Board of Barton and Eccles, considering that the time had come when they must appeal to Parliament, presented a joint petition against the Order, urging that the Corporation had ample works for their own borough, and that, if additional ones were required, it would be much better that the petitioners should be allowed to construct their own, and supply themselves, rather than that they should any longer submit to the oppression they had hitherto borne from Salford, and pay an unnecessarily high price for gas in order to relieve its rates. [The learned Counsel quoted at some length from the petition, and animadverted in strong terms upon the management of the gas-works.] The petition was a general indictment of the Corporation in respect of the management of their gas-works; but it was not uncalled for; for when they went before Parliament, the facts were admitted, and their own Committee of Investigation had endorsed every word in the petition. In the course of the proceedings, the Salford people intimated their willingness to carry out the wishes of the petitioners; accordingly a clause was inserted in the Order to the effect that if at any time, within two years from the passing of the confirming Act, the Local Authorities for the districts of Swinton and Pendlebury, and of Barton, Eccles, Winton, and Monton, should, either jointly or separately, apply to Parliament for power to supply with gas their own and other districts within the limits of supply of the Salford Corporation, and to purchase the portion of the gas undertaking of the Corporation situated within these districts, it should not be lawful for the Corporation to oppose the application, except in so far as it might be necessary to secure the insertion in any Act of clauses to protect their interests with respect to the purchase; and if such powers of purchase were granted, the Corporation should sell the portion of their gas undertaking in question, at such price as should, in default of agreement, be fixed by arbitration under the provisions of the Lands Clauses Act. It was in consequence of this clause that the promoters were now before their Lordships; and he was sure they would regard it as a reasonable arrangement. When districts had something like 50,000 inhabitants, they had a right to have their own gas-works; and if any profit was made from the supply of gas, it should go to the relief of their own rates.

The CHAIRMAN: Is the population of Swinton and Pendlebury 50,000?

Mr. BIDDER replied that Swinton, Pendlebury, Barton, and Eccles together contained 50,000 people; but the population of Swinton and Pendlebury alone was about 22,000. The learned Counsel then proceeded to explain that last autumn the present Bill was initiated by a Joint Committee of the two Boards, but that the Barton and Eccles people had changed their minds, and that therefore the Swinton and Pendlebury Board were alone promoting the Bill; but they were prepared to agree to a clause giving the Barton and Eccles Board power to acquire from them the works in their district, in the event of their making up their minds to this effect within twelve months. It was necessary that they should put upon them a definite time to decide, because, until they knew whether or not they were to build gas-works to supply the Swinton and Pendlebury district only or the whole district, they could not set to work with their plans. He then referred to the petition of the Salford Corporation, which objected to the proposal on the ground that last year's arrangement authorized them to sell to the two Local Boards, and not to one alone; but he (the learned Counsel) maintained that the promoters were acting quite within the lines of the clause in coming separately for the present Bill. He was astonished that, before a Parliamentary Committee, which did not usually encourage mere technicalities, such an argument should be attempted. What could be more absolute than the former part of the clause, which said that, if the two Boards jointly, or either of such Boards separately, applied to Parliament for powers to supply the districts, and to purchase the necessary portion of the gas undertaking, it should not be lawful for the Corporation to oppose, except for the purpose of getting protective clauses? With regard to anything they might have to say as to the terms of purchase, or any clauses that were proper for their protection, so that they should be dealt with justly in all respects, he was not only willing that they should present their case to the Committee, but was anxious to give them everything they could reasonably ask at their Lordships' hands. Nothing could be further from the wish of his clients than that the purchase should be carried out in any way that would do injustice to the Corporation of Salford. Turning to the petition of their "*quondam* partners, and now unwilling opponents," the Local Board of Barton and Eccles, the learned Counsel said it was presented entirely against their own conviction, and at the instigation of the ratepayers, or such of them as had been brought under Salford influences. The petition claimed the right to deal directly with Salford for the purchase of the works within their district, instead of through Swinton as proposed in the Bill; and they objected to the maximum price to be fixed in the Bill as being "far in excess of what is now being charged for gas in their district, and to the proposed quality or illuminating power of the gas, which is less than that now given by the Salford Corporation." The maximum price in the Bill was 4s. per 1000 cubic feet; and undoubtedly it was greater than that now charged—viz., 2s. 8d.; but everybody understood the difference between actual and maximum price. The latter was intended to cover all contingencies that might arise in the future. Coal might go up to 40s. or 50s. per ton; and if Trades Unions went on as they were now doing, it was quite within the bounds of reason that it would do so. The price of labour might advance, and other matters occur to increase the expense of gas production; and residuals might not be saleable at the same price as now. But the proper comparison should, he maintained, be between the maximum proposed in the Bill and the maximum price of the Salford Corporation gas, which was 5s. per 1000 cubic feet, though they were only charging 2s. 8d. now.

Mr. BATTEN: It is 2s. 6d. to large customers.

Mr. BIDDER said it was useless to confuse the matter with the question of large consumers. The maximum price was 5s.; and therefore, in substituting for it a maximum of 4s., they were *pro tanto* giving them an advantage. As to the illuminating power, the position was this: In the Bill as originally deposited, the illuminating power proposed was 14 candles, which was a very common standard; but, in view of the circumstances of Salford and its neighbourhood with regard to coal and other matters, they considered they ought fairly and reasonably to take upon themselves a higher responsibility. They therefore now proposed to fix it at 16 candles, which was the same as that which applied to the London Gas Companies. In respect of the illuminating power of Salford gas, there was a falling off on paper, as in the Salford Act it was 18 candles. This, however, was a very exceptional thing; and they did not conform to it, because, as a matter of fact, their gas averaged

about 15 candles. They were bound by law to give 18 candles; but the gas went down to 15½ and 15 candles, and sometimes, he believed, even lower.

Mr. HANS HAMILTON, on behalf of the Salford Corporation, protested against Mr. Bidder's statement; and said he should have evidence to show that the illuminating power was 19 or 19½ candles.

Mr. BIDDER said that at the proper time, evidence would be given by those who had tested the Salford gas, and found it 15 or 15½ candles. He was not prepared to deny that there were occasions when it might have risen as high as 18 candles; but they were exceptional.

The CHAIRMAN asked, supposing it was fixed in the Bill that the illuminating power in any place should be 18 candles, and it was found to be only 16, what remedy had the complaining party.

Mr. BIDDER explained the gas-testing arrangements of the Metropolis, and the penalties attaching to non-compliance therewith; and he said the same process was adopted in the case of provincial gas-works. Learned Counsel then proceeded with the petition of the Barton and Eccles Local Board, which complained that the promoters might charge an excessive price for gas supplied in their district, and apply the whole of the profit to the reduction of the rates in the Swinton district. In other words, they urged that the promoters might play the same game with them as Salford had been playing, and put on a differential rate, and make profits out of them to the relief of Swinton. It was not their intention to do anything of the kind; and they were prepared to put into the Bill a clause prohibiting a differential rate, so that the price of gas should be the same throughout the whole district, and this would effectually protect them against any such oppressive inequalities in prices as they had both experienced at the hands of Salford. Referring to the petition of the Guardians of the Barton-upon-Irwell Union, he said the promoters were willing to accede to the suggestion in that petition, and to insert a clause providing that they should come under the same obligations as to the limitation of profits, and have the same remedy at Quarter Sessions, as in the case of a gas company. With regard to the fear expressed in the petition that the purchase of the works, accompanied by an expensive arbitration and the construction of new works, would result in the charge for gas being increased, Counsel said that, if the petitioners would reflect upon the conditions at the present time, and remember that they were paying a differential rate of 9d. beyond that paid in Salford, they might be perfectly certain that the promoters would be able to supply them with gas at a considerably lower figure; and he thought he should be able to show clearly that they would get a reduction of something like 5d. or 6d. per 1000 cubic feet. Having dealt with the petition of the Little Hulton Local Board, to whom, he maintained, the provisions of the Bill would be beneficial, he suggested that if Mr. Balfour Browne, on behalf of the Salford Corporation, wished to maintain their extraordinary position—notwithstanding last year's arrangement, under which they were not to oppose the preamble—it would be better that the Committee should hear what he had to say.

Mr. BALFOUR BROWNE then addressed their Lordships in support of the *locus standi* of the Salford Corporation against the preamble of the Bill; urging that the proposed sale to one only of the two Local Boards concerned made a very material difference to them, as he should be able to show when they came to the evidence. No doubt his hands were tied to a certain extent; and therefore he intended to leave the fighting on the preamble mainly to those whose hands were unfettered.

Mr. BIDDER having been heard in reply on the *locus standi*,

The CHAIRMAN said the Committee took what he believed was the common-sense view of the clause, and were of opinion that the Corporation had no right to oppose the Bill.

Evidence was then given on behalf of the promoters.

Mr. *P. Hampson*, ex-Chairman of the Pendlebury Local Board, detailed the steps that led to the action of the Board, and recapitulated the main provisions of the Bill.

Cross-examined by Mr. LITTLER, witness said he was of opinion that the control in a matter of this kind should be in the hands of the body that was willing to carry out the provisions of the Act of Parliament. Eccles, he admitted, was the larger municipal body; but Swinton was willing to do what the Act proposed. There was a clause in the Bill providing that Eccles should have the option either of taking their gas from Swinton, or of purchasing their share of the undertaking, and supplying their own customers.

Monday, March 21.

On the resumption of the proceedings this morning,

Mr. BALFOUR BROWNE intimated that the Corporation of Salford would reserve further action until the Bill was in the House of Commons.

Mr. *Hampson* then gave further evidence, and expressed, on behalf of the promoters, a desire to meet the wishes of the Eccles Local Board as far as possible. He said he believed there would be no objection to extending the arbitration period so as to enable Eccles to acquire its share of the undertaking.

In answer to Mr. LITTLER, witness said he believed that, in the outlying district of Cadishead, there were five or six miles of mains, and only about 50 consumers. It was a great concession, he admitted, to propose to supply these people at the same rate as the consumers in the populous part of the district.

Mr. LITTLER said that the Eccles Local Board did not desire to act the part of dog-in-the-manger, and would prefer that Swinton should get the Bill, provided Eccles obtained reasonable terms, and was not unduly handicapped in regard to the outlying district of Cadishead.

Mr. BIDDER stated that the promoters of the Bill were quite prepared to adopt the principle of equal rating all over the district; but assuming that Eccles took its share of the gas undertaking—as he had little doubt it ultimately would—Cadishead would fall to the Eccles district; and he fully admitted that Eccles should not be bound to anything that was unreasonable. If the Eccles Board could convince the Committee as to the reasonableness of a differential rate for a certain portion of the district, he should not oppose the proposal.

Mr. PEMBROKE STEPHENS, on behalf of the Barton Rural Sanitary Authority, complained that his clients were directly affected by this change of front.

Mr. *H. Bramall*, Civil and Mining Engineer, of Pendlebury, and General Manager of Messrs. Knowles's collieries, next gave evidence as to the unsatisfactory character of the gas supplied by the Salford Corporation, and said that his firm had been compelled to substitute the electric light.

Mr. *Corbet Woodall*, C. E., examined by Mr. FREEMAN, said he had been acquainted for a considerable time with the promoters' district, in connection with the Salford gas supply, and was retained by the Eccles and Swinton Local Boards with reference to the opposition to the Salford Provisional Order of last year; and it was partly in consequence of his advice that the objections which those Local Boards raised were brought before Parliament. He was not in a position to speak as to complaints about the gas itself, but he was as to the administration of the undertaking as against the out-townships. His chief complaint was that the price charged to these out-districts was excessive, and most unnecessarily high. He considered that the inserted clause was a reasonable one, and that the proposals of the present Bill would fairly carry out the concessions obtained last year. He thought the site selected a good and convenient one; and he had had under consideration the size of the works proposed to be erected. The quantity of gas supplied by the Salford Corporation in 1889 in the outlying districts was as follows: Eccles and Patricroft, about 77 million cubic feet; Swinton and Pendlebury, about 50½ million cubic feet; Barton rural district, about 21 million cubic feet; and Little Hulton, 5½ million cubic feet. He had assumed an increase of 20 per cent. upon these figures, as representing not only the increase between 1889 and now, but from 1889 to the time when the works would be finished and ready to supply gas; and this gave about 170 million cubic feet as the quantity to be provided for when the works were put into operation. Taking 170 million cubic feet per annum, it would work out to something like a million cubic feet of gas per day; and for this he had provided in his estimate. The works were arranged to allow of extension to about double the capacity named. The cost of works, &c., he estimated at £61,000, which included way-leaves, approach-roads, and all matters of that kind. In addition to this, payments had to be made to the Corporation of Salford, in respect of property which would be taken over from them; and, beyond the £61,000, it would be necessary for the Local Board to have a certain amount of working capital in hand, which would be provided out of the £100,000 named in the Bill.

Mr. RAM (in cross-examination): If Barton and Eccles were not united to Swinton, and made their own gas, they could produce and supply it certainly cheaper than Swinton and Pendlebury can hope to do under the present scheme, could they not?

Witness: I think they would have some little advantage.

May I put it that, in your opinion, they would be able to sell it at least 3d. per 1000 cubic feet cheaper than Swinton and Pendlebury will be able to sell it at under this scheme?—No, you may not.

How much cheaper would it be?—I would rather not name an amount as a mere guess.

If Swinton has already bought from Salford, we naturally, if we came to buy from Swinton, should have to pay a proportion of the price which Swinton had paid to Salford?—It would be reasonable.

Would it not be reasonable, that being so, that Eccles and Barton should have a voice and be heard at the arbitration which would settle the price to paid to Salford?—I think it would be desirable, undoubtedly, if Eccles and Barton are to take a portion of the supply, that they should be present at the arbitration; but I altogether decline to take any responsibility upon the Local Board of Swinton for the fact that Barton will not be there then.

I do not ask you to take any responsibility. But do you share the opinion which Mr. Hampson expressed, that it would be not unreasonable that the action should be suspended for a time, in order to enable Eccles and Barton, after they are incorporated, to come in, if they so desire, and be a party to the arbitration between Swinton and Salford?—So far as I have seen, there has been an entire disposition upon the part of the Swinton Local Board to remain by the Eccles Local Board. I heard what Mr. Hampson said; and I agreed that they should postpone it, and that the two Boards should work together in that arbitration.

If differential rates are wholly abolished, and if the Barton Rural Sanitary Authority and Little Hulton are to be supplied, would it not, in the absence of a differential rate, be a necessity that the price of gas must be very much higher than it has hitherto been in the district?—No; it is not a great matter of difference. The total value of the differential rate to Salford in the year 1889 was a little more than £3000; and the Barton Rural Sanitary Authority and the Little Hulton Local Board contributed £1020. It is undoubtedly a very large concession to the out-districts, and is a matter of very vital consequence to the supplying body.

You agree, do you not, that in the district of the Barton Rural Sanitary Authority there is one part where there are six miles of pipe and only about 50 consumers served from it?—I do not see how that is possible. But I would say, even upon that supposition, if I were advising the Swinton Local Board, and found the supply of that district could be only had at the rate at which we are supplying Swinton, that I would lay the mains and take up the business rather than not supply it. That district is likely to profit very much by the construction of the Manchester Ship Canal, which happens to run right through it; and I have no doubt whatever that there are districts round about that will grow very rapidly; so that it is worth while to invest money in order to occupy them.

The CHAIRMAN: Does this Bill propose to supply all the districts at an equal rate?

Witness: The Bill does not propose that; it says nothing about a differential rate. But, within the maximum price named in the Bill, the promoters would be at liberty to charge a differential rate if they pleased.

Mr. J. D. FITZGERALD: There are no clauses in the Bill preventing the promoters from imposing a differential rate. They may charge 4s. instead of 2s. per 1000 cubic feet outside the district.

In cross-examination by Mr. FITZGERALD, witness stated that, when he advised the Local Boards last year, he said the price charged by Salford was unnecessarily high to the outside districts, and that this was due, first, to the fact that they had differential rates; and, secondly, because they made a profit upon the supply of gas. He did

not, however, express the opinion that there should be no differential rate. In the case mentioned by Mr. Ram, he (witness) would advise the laying of the main and taking possession of the district at the same rate as that charged in Swinton, if by this means only it was possible to get possession of it. Although it was reasonable to charge a differential rate, it should not be without limit; and he should think 3d. per 1000 cubic feet would be reasonable.

Mr. FITZGERALD: If it is unreasonable for Salford to charge a differential rate of 2d. per 1000 cubic feet would it not be unreasonable for Swinton to charge one of 3d.?

Witness: You are mistaken about the Salford differential rate—it is 9d. as against that district; and I say that that is a somewhat unreasonable difference. The great point was that, in addition to this differential rate, Salford was charging a very large amount in order to relieve the rates of their borough. What I say is that, if a gas undertaking is conducted in the interests of the consumers, it would be reasonable to charge a differential rate; but when it is carried on as at Salford, so that upon the whole capital they take 13¾ per cent. profit, it is most unreasonable to make the out-districts contribute their proportion, and pay in addition a considerable differential rate.

You know that, under the Bill as it stands, you can use the profit in aid of the rates?—We can.

In addition to the differential rate outside?—You have heard that the differential rate is surrendered, and you have heard also that the Local Board are willing to consent to limiting the amount of profits they may take. So far as I am aware, this is the first time that a local authority has made such a proposal to Parliament.

It is not the first time that Parliament has imposed such a condition upon a private company?—No; I know of one case.

Cross-examination continued: With regard to the limitation of profits, he was not authorized to make any proposal. The only suggestion of a limitation was that of adopting the principle applied to a gas company; and in that case they were allowed to divide 10 per cent. on original capital, and 7 per cent. on future capital. With reference to the suggestion made last year on the Salford Order, that, after paying the expenses connected with their gas undertaking, and the annual charge for annuities, interest on moneys borrowed, adding to the sinking fund, and properly providing for their depreciation fund, the Corporation ought to have applied the balance of profit for the benefit of the general body of gas consumers, both within and beyond the borough, by reducing the price of gas, he thought in a certain sense it would be reasonable. If it were applicable to one, it should be to the other. But this must be carefully remembered—that Salford had for many years been taking out of the gas undertaking, and from the consumers both outside and within the borough, the most extravagant amount of profit; and it was not unreasonable for the petitioners, when they went to Parliament last year, to say the Corporation had taken so much in the past that they ought henceforth to take no more.

Mr. FITZGERALD: I suppose you will agree with what has been already stated—that the larger the works, the more cheaply gas can be manufactured?

Witness: Within limits, yes.

And it follows from that that the Salford Corporation can manufacture gas more cheaply than the Swinton Local Board could?—The Salford Corporation should be able to do so; but it is one thing to manufacture, and quite another to supply. I have never said that we can manufacture gas more cheaply; but I do confidently hope that we shall supply it more cheaply.

Of course, if you can manufacture more cheaply, you can also supply more cheaply?—If we choose.

If your profits are limited?—Yes.

Cross-examination continued: The difference between the cost of supplying the whole district and the cost of supplying Swinton alone I take to be about 3d. per 1000 cubic feet. In my estimates I have taken the cost of coal at 10s. 6d. per ton delivered into the works; and from this quantity I have assumed that I sell 9500 cubic feet of gas. I have credited against the cost of the coal 5s. 8d. for the value of the residual products. This leaves the net cost of coal at 4s. 10d. Allowing for salaries and wages, purifying, wear and tear, expenses of distribution, rent and taxes, and management, the cost comes out to 17·85d. per 1000 cubic feet. I may say that, in view of the disturbed condition of the coal trade, I made another calculation, assuming the price of coal to be as high as 12s. per ton; and this came out at 19·75d. But I think the 12s. is an unnecessary amount to estimate for the cost of coal. The difference in the cost of manufacture between 16 and 18 candle gas would be about 3d. per 1000 cubic feet—rather more than less. If the works are situated at a higher level than the district to be supplied, it involves additional pressure; but that does not necessarily mean an increase of leakage. If there are leakages at all, more gas would escape at a high pressure than at a low one; but we should try to avoid having any leaks. Besides, the quantity of gas lost through leakage from mains is not very considerable.

In cross-examination by Mr. BATTEN, witness said he thought there were probably no gas undertakings in the immediate district of Salford supplying gas at a lower price than that charged by the Corporation of that borough; but he believed he had made it clear to the Committee why he considered the promoters would be an exception to the general rule. The Corporation ought to be able to manufacture and supply gas as cheaply as anybody else; but it did not matter to the promoters at what cost they produced it. They knew what they had to pay for it. Out of the price the Corporation had been charging, they made practically 17d. profit, from which they had to pay interest. The conveyance of coal to the gas-works at Farnworth and Kearsley might involve 2d. or 3d. per 1000 cubic feet charged to the cost of the gas.

In re-examination by Mr. FREEMAN, witness said he did not know, as a matter of fact, that the gas supplied by Salford was not always up to the standard. He found that the returns made by Mr. Davis were identical with those obtained by the illuminating power meter; and having on two occasions tested the results with Mr. Davis's apparatus and the meter, he could confirm the accuracy of the observations. The results Mr. Davis obtained were either 15·6 or 15·8 candles; and on the last occasion, it was 16·4 candles.

Mr. *G. E. Davis*, Analytical Chemist, of Manchester, gave the results of tests he had made of the Salford gas. In July, 1891, its illuminating power averaged 14·7 candles; in August, 14·34 candles; in September, 14.40 candles; in October, 15·20 candles; in November, 15·16 candles; in December, 14·72 candles; in January, 1892, 15·09 candles; and in February, 14·76 candles.

The CHAIRMAN said that the Committee had quite sufficient evidence with regard to the quality of the gas. They were of opinion that the complaints as to both cost and quality were well founded; and therefore they did not want this evidence to be overlaid.

Mr. PEMBROKE STEPHENS respectfully suggested that their Lordships should not assume this from the statements made on one side, as that would be to assume the whole case. He had the official records, which showed that those statements were not well founded.

In reply to the CHAIRMAN, witness said the illuminating power of the gas might drop 1 candle in transit from the gas-works to his premises; but it was not a question of loss. The average gas that went out from the works was of lower quality than that tested by the Corporation photometers. He did not mean to imply that the deficiency arose from anything fraudulent; but merely from careless manufacture.

Sir *F. Bramwell*, F.R.S., examined by Mr. SAUNDERS, quoted the case of Birmingham and the outlying authorities as a precedent for the purchase by Local Boards of portions of the undertaking of a large Corporation. He said he considered it a desirable thing that the promoters should have the powers they applied for.

This being the whole of the evidence for the Bill,

Mr. BATTEN addressed the Committee on behalf of the Little Hulton Local Board. He objected to the inclusion of that district in the area of the Swinton and Pendlebury Board, but said that, if included, it ought not to be charged any more than it was paying at present for the same quality of gas.

Mr. *J. Roscoe*, a colliery proprietor at Little Hulton, was called in support of the learned Counsel's case, and stated that the district was supplied by the Farnworth and Kearsley Gas Company as well as by the Salford Corporation, and the inhabitants were averse to any change.

Mr. PEMBROKE STEPHENS, for Barton-upon-Irwell, called Mr. *J. W. Whitworth*, as representing the Guardians; and the witness stated that they also objected to being included in the Bill.

Tuesday, March 22.

Mr. *Cosmo C. Hooley*, Surveyor to the Rural Sanitary Authority of Barton-upon-Irwell, gave details as to the population and levels of the district, and other local circumstances; stating that there were colliery workings beneath the surface of the ground, which was liable to subsidence.

Mr. *T. Newbigging*, C.E., examined by Mr. PEMBROKE STEPHENS in opposition to the Bill, said he was well acquainted with the districts which were the subject of the present inquiry, having lived in the neighbourhood for 17 years. The Barton Rural Sanitary Authority desired that the present arrangements should not be disturbed; and they had very good reason for it. First of all, the proportion of outlay of capital by the establishment of other gas undertakings would be larger; and they did not desire to see a multiplication of gas-works in the locality. The cost of administration and management, and the general working expenses, would necessarily be increased; and therefore the selling price of the gas would be greater than if it were produced and distributed from one common centre as at present. The consumption of gas in the Swinton district during 1891 was 52 million cubic feet; in the Eccles district, 89 million cubic feet; in the Little Hulton district, 6½ million cubic feet; and in the district of the Barton Rural Sanitary Authority, 30¾ million cubic feet. The four places added together gave a total of 178 millions. This was the consumption which the Swinton Local Board proposed to take over. It was only 20 per cent., or one-fifth, of the Salford gas supply, which in 1891 amounted to 901 million cubic feet; but assuming that the promoters obtained their Bill, it would not be sufficient that they should erect works for the supply of only 178 million cubic feet of gas. The increased consumption of four more years—from 1892 to 1895—would have to be added to this figure, because the works could not possibly be commenced until well into next year, and it would be the supply of 1895 that the Swinton people would have to deal with. The increase in the consumption of gas in the Salford district during five years had been 3¾ per cent. per annum; and taking the future increase at the same rate in the districts named, in 1895 the consumption would be 203 million cubic feet. At the very outset, the works would have to be made capable of supplying at least one-fourth more gas than the quantity he had named, because it would never do to build them without a margin to meet contingencies, and also to provide for the growing increase. This would bring the total up to 254 million cubic feet, which the works should be capable of supplying when completed. He had taken as the cost of erecting works and providing the general capital of an undertaking of this size £625 per million cubic feet of gas produced per annum. Multiplying the 254 millions by £625, it gave a total of £158,750 as the capital required for the erection of the works and plant; but this figure did not include anything in the shape of goodwill that might have to be paid to Salford. That amount would have to be ascertained by arbitration. He had prepared a table showing the price per 1000 cubic feet at which gas of the same quality as that of Salford could be made and sold at works equal to a consumption of 254 million cubic feet, with a capital of £158,000. The year's production would be 279¼ millions; but there was always a certain amount of loss, or unaccounted-for gas, which he estimated at 25¼ millions, or about 9 per cent. In order to produce gas of the Salford quality, which was between 18 and 19 candles, it would be necessary to use cannel with the coal. To supply 18-candle gas, and to be safe from penalties, it was necessary to supply gas of a quality about 1 candle above that prescribed. The amount of coal that would be required to produce the above-named quantity of gas would be 22,360 tons, at 12s. per ton, which was the price delivered at the proposed gas-works. Salford was paying not quite so much—about 11s. per ton; but it was because they had a contract running for three years at the lower figure. [Witness produced a price list of January, before the disturbance in the coal trade began, but said the price was now 2s. or 3s. per ton higher.]

Mr. BIDDER asked to see the list, as he said he happened to be the Chairman of a Gas Company buying it at 9s. 6d. per ton.

Witness: Yes; but where do you get it from? Newcastle, I suppose?

Mr. BIDDER: It is the best Durham gas coal.

Witness: Exactly; we do not use any Durham gas coal at Salford.

Examination continued: They had to use at Salford, for the purpose of producing the high quality of gas—18-candle—which their Act required, a considerable quantity of cannel. During the last ten years, the proportion of cannel to coal had been 30 per cent. The coal and cannel together—the latter at 22s. per ton, the former at 12s.—amounted to £19,565, or equal to 1s. 6·48d. per 1000 cubic feet of gas sold. From this he deducted the produce of the residuals, which he put down at £7991, or equal to 7·55d. per 1000 cubic feet of gas sold, which left the net cost of the coal at 10·93d. To this must be added the working expenses, the cost of purifying, including the materials, wages and salaries, repairs and maintenance, rates and taxes, stationery and printing, and incidental expenses, which amounted to 1s. 3d. per 1000 cubic feet of gas sold; making 2s. 1·93d. To this should be added 2d. per 1000 cubic feet for depreciation, or, as it was called in the case of a statutory gas company, the reserve fund. The interest on the money borrowed and the sinking fund would amount to 7·07d. per 1000 cubic feet, which would bring the total cost up to 2s. 11d. If Swinton charged meter-rent, this would reduce the price by 1d.; so that they could make their gas and sell it at less than 2s. 10d. per 1000 cubic feet—giving them every advantage. This was the future before the Swinton district if the Bill should pass. The position to-day was as follows: The price within the five-mile radius outside of the borough was 2s. 8d. per 1000 cubic feet to small, and 2s. 6d. to large consumers; beyond that line, 2s. 11d. and 3s. 1d.; and he believed there was a reduction announced on those prices. He had not the slightest doubt that, if the Bill passed, the price would be raised all round the district; and therefore it was not surprising that they should wish to be left alone. In all his experience he had never heard of a district being, against its will, taken out of the area of one authority and put into that of another; nor was there any precedent in England for reducing the illuminating power of the gas as proposed in this Bill.

Mr. PEMBROKE STEPHENS: If you have a quality of gas which has existed for years, and is a recognized standard, would you say that to reduce it was a forward or a retrograde step?

Witness: A very retrograde step. In these days of competition with oil and the electric light, it is a most serious step to take. Indeed, to approve of such an arrangement as that, and to reduce the standard of illuminating power, would be to create a very objectionable and most dangerous precedent. I should look upon it as a calamity to the district to reduce the illuminating power of the gas 2 candles.

In further examination, witness said the charge made by Mr. Davis that the gas sold to the consumers was 3½ candles below the standard was a very serious one. It so happened that on the very day—the 12th of March—on which Mr. Davis tested the gas, and gave it at about 15 candles, he (witness) himself tested it, and found it to be 18·4 candles. He considered the site of the proposed works very badly chosen. However well conducted gas-works might be, they were more or less a nuisance in their neighbourhood. The level was also bad, as the gas would have to flow down; and it lost an inch of pressure in every 100 feet of descent. Extra pressure would have to be put on, which would tend to create leakage through the pipes; and in a colliery district such as the one in question, it would be especially objectionable.

Mr. BIDDER (in cross-examination): You have given a number of figures to show that we cannot make gas at the price we have named. You began by stating that the cost of coal, after deducting the residuals, would be practically 11d. per 1000 cubic feet of gas sold.

Witness: In a book published every year, giving statistics referring to all the large gas-works, it was shown that the cost of coal in Salford, less residuals, was less than 7d. per 1000 cubic feet. At Manchester, it was 9¼d.; at Leicester, 4¼d.; at Leeds, 6d.; and at Oldham, 7¼d. Swinton could not work so cheaply with regard to coal as Manchester or Salford. The figure of 1s. 3d. for the cost of labour compared well with 1s. 2d. at Salford, because they could not reduce to the price of Salford the working expenses in a concern which was five times smaller. He believed Salford did not at present put aside anything for either depreciation or reserve fund.

Assuming we get our coal at the same price as Salford, that we work at the same cost, and do not have the depreciation fund, in addition to the sinking fund, following the example of Salford, what does it make your figure of 2s. 11d. as the cost of gas?—If you have no depreciation fund, it would take off 2d.

But then there is 4d. off coal, 2d. off working expenses, and 2d. off depreciation. According to your own account, the 2s. 11d. comes down to 2s. 3d.?—Yes; that is so, taking your figure. That is for 16-candle gas. Now we are getting 18-candle gas.

I am adopting the Salford price for 18-candle gas. Taking the cost of coal and working in the Salford case—2s. 3d. as the cost price, including interest on capital and sinking fund—we can well afford to sell gas at 2s. 5d., or even 2s. 4d., per 1000 cubic feet. Is not that so?—Yes; if you economized to that extent.

Mr. Woodall contemplated providing for 180 million cubic feet of gas; and you say he will have to meet a larger consumption. If that is so, that is so much the better for us, because, by your own showing, the larger the consumption the cheaper the gas?—No; I do not say the larger the consumption the cheaper the gas. Within certain ranges, it makes no difference whatever. I should say from 150 to 300 millions makes very little difference; but when you come to 1000 millions you have a difference.

Does an increased consumption tend to cheapen the cost?—It does, but within that range very fractionally indeed.

Then if you are right and Mr. Woodall is wrong as to the quantity of gas we shall have to provide for, it is so much the better for us, though it may be only a fraction in the cost of production?—No; but I have endeavoured to show how crude this scheme is. They only reckoned for 177 million cubic feet, whereas 254 millions must be provided for. I have shown very distinctly that this scheme has not been well considered.

Mr. Woodall has told us that he provided, in the first instance, for the consumption he has to deal with. I suppose the works can be put up in a year, can they not?—No; they cannot be commenced for a year and a half, because, under clause 48 in the Bill, Eccles has power to purchase. It would never do for Swinton to expend £150,000 or £160,000 upon works of which they are going to dispose. It will be 18 months before the works are commenced; and it will be a year and a half or two years from the present time before they are completed.

You have given us £625 as the capital cost per million cubic feet of gas. That is larger than the ordinary expense of corporations, according to these statistics, is it not?—The cost of gas-works belonging to local authorities in England and Wales is, on an average, £681 per million. I have taken it at £625. The cost of gas-works belonging to companies is £630 per million.

Is it the fact that in the last ten years Salford has applied to the borough fund, in reduction of its own rates, £400,000 out of the gas profits?—I do not know how much it is; I know they have applied a good deal.

Obviously, having regard to the differential rate, the bulk of it has been taken out of the outlying districts?—I do not agree with that at all. There is a good deal of "blowing hot and cold." At one moment they say these works have been disgracefully managed; at another, they say they have laid aside, in reduction of the rates, £400,000. Which are we to believe? Either the one or the other must be wrong.

But have they disgracefully managed the profits taken out of us by the monstrously high price?—Whatever has been laid aside has been done legally. Personally, I am opposed to the making of these large profits.

But assume for a moment, though it is open to argument, that it has been done legally, and assume that the bulk of the £400,000, or a large proportion, has been taken out of the pockets of Swinton, Patricroft, and the Barton rural district, and applied in reduction of the Salford rates, do you not think that it is almost time that this sort of thing should cease?—Yes, I do, if that is so. I have invariably advocated it, and also a lower differential rate; but I have been always in favour of some such rate. I say there ought to be a differential rate in a sparsely-populated district.

Are you prepared now to tell their Lordships that at least half of that £400,000 has not been taken out of the pockets of the outlying districts?—I am not; and I do not believe it. There is just one point I should like to mention. Mr. Woodall was asked if his clients would agree to a limitation of the profits. He suggested adopting the principle of a gas company, and said that in the case of a company the original capital is allowed to carry 10 per cent., and future capital 7 per cent. dividend. The effect would be this: The capital of the company, I say, would be £156,750. Mr. Woodall proposes that this should be called original capital, entitled to 10 per cent. Now, 10 per cent. on that amounts to £15,675. The sinking fund and interest, as I have shown, amounts to about £7500. Deduct £7500 from £15,675, and we have £8175 left as net profit, which it is suggested these people should make, after paying all their expenses, and even allowing for depreciation. The Salford works are five times larger than these, and yet Swinton proposes to make £8000 profit, after paying all expenses.

Mr. *Corbet Woodall* was recalled, and said he desired to make an explanation. It had been a little difficult to follow the evidence, and prepare anything like a reply to it, on the spur of the moment; but he would like to point out that the estimate of 170 million cubic feet, which he had given on the previous day, was a printer's error in his proof. The quantity with which he dealt totalled up to 185,633,000 cubic feet; and this bulk of gas he calculated would have to be delivered at the end of the year 1893. The figure that Mr. Newbigging had given was 178 million cubic feet in 1891; and with 3½ per cent. in addition, it would come to almost exactly his figure. Furthermore, the cost of the works which he had given on the previous day was necessarily based upon the maximum quantity of gas to be made in one day. His estimate for those works was a million cubic feet a day; and he found that he had a margin of a little over 10 per cent. This would be sufficient to provide 190 million cubic feet per annum, according to Mr. Newbigging's multiplier of 190. He had therefore provided works amply large enough, according to Mr. Newbigging's own estimate, to meet the demand at the time they would be brought into use: and if the quantity was to be increased, he was quite prepared to enlarge his works. The site was capable of allowing an extension to 2 million cubic feet per day; and the more they made, the better they would like it. Witness also explained that there was very little in the objection that had been taken on account of the levels.

Sir *F. Bramwell* was also recalled; and, in reply to questions put by the Committee, said he attached no importance to the differences in the levels.

Mr. *F. Jones*, F.R.S.E., examined by Mr. FITZGERALD, said he had been Consulting Chemist to the Gas Committee of the Salford Corporation for some years, and had made regular examinations of the illuminating power of the gas supplied. He tested it from the main supplying the town; and the results showed that the quality varied from 18½ to 19 candles.

In cross-examination by Mr. SAUNDERS, witness said that, in his opinion, the illuminating power meter used by Mr. Woodall for testing the gas was not a reliable instrument, and that it was possible for it to err to the extent of 4 out of 18 or 19 candles. It was not so reliable as the standard photometer.

Mr. FITZGERALD then addressed the Commissioners on behalf of the Barton Rural Sanitary Authority; commenting at considerable length on the evidence which had been given on either side. If the Bill were passed, he asked that they should be struck out; and he urged that it would be unjust, under all circumstances, that the district he represented should be excluded from relief of its rates from the profits, if any, realized on the gas undertaking.

Mr. LITTLER followed for Barton and Eccles; maintaining that the promoters would not be able to make gas any cheaper or better than Salford was doing, and asking that they also should be excluded from the operations of the Bill. If Swinton and Pendlebury were capable of having their own works, *à fortiori* Barton and Eccles should have theirs; and he asked that no steps should be taken which should in any way bind the district for which he appeared.

Mr. BIDDER was heard in reply. He urged that, if the opposing districts were struck out of the Bill, it meant defeating it altogether. The promoters were faithfully carrying out the intention of Parliament, as expressed last year. They were there alone, because their partners would not come with them. However, they were acting in perfect good faith for the benefit of everybody; and he thought it would take a great deal to bring their Lordships to the conclusion that Parliament was wrong. In point of fact, no one had shown any reason for reversing the decision of 1891.

After some consideration in private, the Committee declared the preamble of the Bill proved; but they declined to include in its operation Eccles, Barton-upon-Irwell, the district of the Barton Rural Sanitary Authority, and Little Hulton.

The clauses of the Bill were agreed to on the following day; and the Committee ordered the Bill to be reported to the House.

HOUSE OF COMMONS COMMITTEE.

Monday, March 28.

(*Before Mr.* HERBERT GLADSTONE, *Chairman; Mr.* W. F. LAWRENCE, *Mr.* A. C. CORBETT, *and Mr.* DUNN.)

LONDON COUNTY COUNCIL (SUBWAYS) BILL.

The Committee on this Bill, whose proceedings, as far as our readers are concerned, were reported in the JOURNAL last week, resumed their sittings to-day, and proceeded to deal with the clauses.

Mr. LITTLER, Q.C., Mr. PEMBER, Q.C., and Mr. FREEMAN appeared for the promoters; Mr. POPE, Q.C., and Mr. BIDDER, Q.C., for the New River and other Water Companies; Mr. POPE, Q.C., Mr. BIDDER, Q.C., and Mr. RIGG for The Gaslight and Coke Company; and Mr. READER HARRIS for the Commercial Gas Company.

Mr. PEMBER said he would take the clause which was still in contest between the promoters and The Gaslight and Coke Company, although it had been agreed with the Water Companies. The clause was to the effect that it should be lawful for the Council to make on the Company using any subway a charge for such use, and for the supervision of the subway and the pipes and wires therein, according to a scale to be determined; and until such scale was settled, the amount of the charge (if not agreed between the Council and the Company using the subway) should be determined by an arbitrator. He thought that, the subway being a matter of very considerable advantage to everybody, the Companies as well as the public, it was fair that the former should contribute something towards the expenses of management and supervision.

Mr. POPE thought it was not unfair for a public authority to say to the Gas Companies that, if they derived any advantage from being in the subway—such, for instance, as not having to bear the cost of breaking up the streets—this should be calculated as a payment to be made by the Companies for the user. He was quite content, on the part of the Gas Companies, to assume this view of the question. But the clause would do more than that—it would make the Companies not only responsible for any advantage they might derive by reason of the transfer of their mains to the subways, but would make them responsible for contribution towards the supervision and maintenance of the subways, which were maintained and supervised in the interest of the public. It would make them responsible for such sum as the arbitrator might say was fair, although they might not derive any pecuniary advantage whatever from this management and supervision.

Mr. READER HARRIS, on behalf of the Commercial Gas Company, concurred in the remarks of Mr. Pope.

The CHAIRMAN: I think the arguments are perfectly clear upon both sides. I should like to know whether the arbitration clause of the Act of 1868 has been acted upon, and whether any guide is given to the present case.

Mr. PEMBER: The Gaslight and Coke Company pays at the present time £150 10s., and the other Gas Companies certain smaller amounts. That sum is paid by agreement.

The CHAIRMAN: I take it that practically there is no opposition to the preamble of the Bill.

Mr. POPE: I am told that the Electric Lighting Companies are opposing the preamble.

The CHAIRMAN: The promoters, I understand, have closed their case.

Mr. PEMBER: That is so.

After some discussion with reference to the points on which the Electric Lighting Companies opposed the Bill,

The CHAIRMAN announced that the Committee considered the preamble proved.

On the following day the case of the Electric Lighting Companies was proceeded with.

Wednesday, March 30.

On the re-assembling of the Committee this morning,

Mr. LITTLER replied on behalf of the County Council to the case of the Electric Lighting Companies; and subsequently a clause was inserted securing that the Council should pay the cost of removal into the new subways of the Companies' wires.

Clause 2*c*, which was dealt with by Mr. Pope on Monday, regarding the charge to be made by the Council for supervision and management, was further discussed.

Mr. CRIPPS stated that he had had some conversation with Mr. George Livesey, the Chairman of the South Metropolitan Gas Company, and understood him to be satisfied with the clause.

The CHAIRMAN announced that the decision of the Committee was that the clause, as presented to them, was approved.

Thursday, March 31.

On the re-assembling of the Committee this morning,

Mr. POPE, dealing with clause 11, as to liability for accident, said that, although he was not concerned to put this on the County Council, he contended that no new form of liability should be fixed upon the Water Companies.

Mr. READER HARRIS said the clause would not be sufficient, unless it included a clear definition as to who was to bear the liability for any explosion, which might not be attributable to either their negligence or their default. He thought the point was vital to the Commercial Gas Company. At present their mains were underground, and there was no danger. They submitted that danger should be provided for, and a liability properly assessed in the Bill.

The CHAIRMAN: Who paid the cost of the explosion in Tottenham Court Road?

Mr. POPE: The Gas Company. They had to pay the whole of the damages that were claimed. I think the liability would be this—that if the explosion occurred by reason of an extension of a *bonâ fide* order of the Council, nobody would pay the damage, and we (the Companies) should be responsible for relaying our pipes and mains at our own expense; but if it were a *bonâ fide* exercise of the power of the Council, we should be entitled to recover against them.

The CHAIRMAN: The Committee consider that the provisions of the Bill shall not extend and apply to any subway which may hereafter be constructed, excepting so far as those provisions shall be incorporated in any such General or Special Act.

The Committee then concluded their consideration of the clauses of the Bill.

Messrs. R. and J. Dempster have recently received orders for a gasholder 80 feet in diameter on the Gadd and Mason system for the Normanton Gas Company. The Wakefield Gas Company have also placed with them the contract to convert two two-lift holders, each 100 feet in diameter, into three-lifts; the top lift being on the above-named system. The Penrith Local Board have ordered a two-lift holder, 75 feet in diameter; both lifts being on this plan. A 60-feet holder, on the same system, with cast-iron tank, has just been put into use at Formby.

The Management of the Goole Gas and Water Works.—A special meeting of the Goole Local Board was held on Monday last week for the purpose of considering the conduct of the Directors of the Goole Gas and Water Company in dismissing the Gas Manager (Mr. J. Whittaker) and appointing a successor without consulting the representatives of the Local Board, who have one-third share in the directorate of the Company. The Chairman (Mr. Gleadow) offered an explanation, showing that he had not been consulted about the dismissal of the Manager, and that when this had been done there was another gentleman in attendance ready to take his position. A resolution was passed protesting against the treatment extended to the representatives of the town on the directorate of the Company.

Opening of New Water-Works for Bombay.—Last Thursday afternoon, the Viceroy of India (the Marquis of Lansdowne) made a special visit to Bombay to perform the ceremony of opening the new water-works for the city, by connecting the existing mains with the new great main which brings the water from the huge reservoir formed by the damming of the Tansa Lake. The construction of this dam, which is one of the largest in the world, and of the mains and conduits through which the water flows to the city, has taken seven years, and has cost the Bombay Municipality about 15,000,000 rupees. The extent of water is about seven miles, and the catchment area 52 square miles. The dam itself is two miles long, and the water from the reservoir is conveyed to Bombay through 61 miles of tunnelling, ducts, and mains. The new works are capable of supplying 31 million gallons of water daily; and the storeage capacity of the reservoir is sufficient to ensure an ample service even in dry seasons. The work was designed by Major Tulloch, and has been carried out, with some modifications, by Mr. Clerk, C.E. The contractors were Messrs. Walsh, Lovett, and Co., of London and Birmingham.

The Constitution and Duties of the Royal Commission on Water Supply.—In the House of Commons last Friday, Sir R. Temple asked the President of the Local Government Board whether he would consider the expediency of adding to the Royal Commission on the London Water Supply the names of one or more influential residents in that part of the county of Surrey which is interested, as being supplied by one of the existing Water Companies, and because their present supply is drawn from the River Thames, which is being exhausted of all its water, to the great detriment of that county. Mr. Ritchie in reply, said that before the Commission was appointed the question of its constitution was very carefully considered. The Commission had not been formed on the principle of obtaining representatives of different districts, but of securing the services of gentlemen who are specially qualified for the important inquiry the Commission have to undertake. The Government could not, therefore, accede to the suggestion of the honourable member. It would, he added, be borne in mind that the Commission, by the terms of their appointment, were to have regard to the needs and claims of the localities not supplied by any Metropolitan Water Company, but within the watershed of the Thames.

Clevedon Gas Company.—At the annual meeting of this Company yesterday week, the Chairman (Mr. E. Button), in moving the adoption of the Directors' report, spoke with regret of its unfavourable nature, and offered some explanations as to the reduced dividend of 3 per cent. on all classes of shares. The cost of manufacturing, he said, had been increased through the consumption of Yorkshire coal mixed with Bristol small; the Directors having been anxious not to reduce the illuminating power of the gas. There had been also an increase under repairs and maintenance of works of £150, which would not appear another year. They had economized in the item of management, by which they hoped to effect a saving in the future. Their residual products had realized considerably less. They could get no purchaser for the ammoniacal liquor; the consequence being that they had a large quantity in stock, producing a loss of £50. They had, however, made arrangements so as to avoid this loss in the future. The Directors hoped that, with the economies effected, they would be able next year to recommend a dividend of 7 per cent. at least. One serious occasion for loss resulted from three breakages of mains, which entailed an outlay of £50 in coal alone, while the leakage was very considerable. The report was adopted, and the dividend recommended was declared.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, March 31.

(*Before Lords Justices* LINDLEY, BOWEN *and* KAY.)

Savory and Moore v. The London Electric Supply Corporation, Limited.

This was an appeal from a decision of Mr. Justice Kekewich, reported in the JOURNAL for Dec. 29, 1891 (p. 1187). The action was by Messrs. Savory and Moore, the well-known chemists and druggists, of 143, New Bond Street, to restrain the defendants, who had been using certain adjoining buildings as an electric light distributing station, from so carrying on their business as to be a nuisance to the plaintiffs. At the rear of their shop in New Bond Street, the plaintiffs had extensive premises, which were used as a laboratory and store for large quantities of chemicals and other valuable goods of an inflammable character. In 1887 the defendants took certain premises adjacent to the plaintiffs' warerooms; and they were also in occupation of the cellars under the Grosvenor Gallery, which lay near the plaintiffs' premises, and they fitted up their buildings and cellars with engine, boilers, and other machinery for the production of electricity and the general purposes of their business. The plaintiffs alleged that in 1890, owing to their remonstrances, the defendants ceased to generate alternating electric currents as they had previously done in their buildings and cellars, and removed the plant. In lieu thereof, they, without the plaintiffs' knowledge and sanction, proceeded to adapt and use their buildings and cellars as a converting and distributing station. The plaintiffs complained that their use for this purpose was highly dangerous. They further stated that already, on the 17th of October and the 15th of November, fires had occurred on the defendants' premises, both of which occasioned great risk to the plaintiffs. By the latter of these fires, the premises were practically gutted, and damage was caused to the plaintiffs by dirt, water, and smoke. As the defendants were proceeding to reinstate their premises with the view of using them for the same purposes as before, the plaintiffs commenced an action on Nov. 20, 1890, claiming an injunction. The defendants denied that their business was attended with risk from fire or would be dangerous to the plaintiffs' premises, and stated that they had proposed to the plaintiffs to take certain precautions against accident. They also stated that they had obtained the approval of the Board of Trade for the supply of the electric current from their premises; and they insisted that the storeage of highly inflammable and explosive materials by plaintiffs created considerable danger to those premises. Justice Kekewich granted an injunction; and the defendants appealed.

Mr. MOULTON, Q.C., and Mr. W. F. HAMILTON appeared for the appellants; Mr. RIGBY, Q.C., Mr. WARMINGTON, Q.C., and Mr. VERNON R. SMITH represented the plaintiffs.

After the appeal had been opened, the parties came to a settlement, on the following terms: The injunction to be dissolved, the defendants undertaking (1) not to use any room except the basement (which was admitted to be free from danger) for transformers until satisfying some person, to be agreed on by the parties, as to its safety for that purpose; (2) not to store inflammable materials in any room used for transformers—the defendants agreeing to pay the costs of the appeal and of the action.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, March 29.

(*Before Mr. Justice* KEKEWICH.)

Gadd v. Mayor, &c., of Manchester—The Gasholder-Guiding Patents.

This was an action brought by the plaintiff, in association with his partner (Mr. Mason), against the defendants for an alleged infringement of his patent of Dec. 12, 1888, for controlling the action of gasholders without the use of the customary guide-framing. The defendants generally denied infringement, and claimed that the patent had been anticipated.

The ATTORNEY-GENERAL (Sir R. E. Webster, Q.C., M.P.), Mr. MOULTON, Q.C., and Mr. L. O. CLARE appeared for the plaintiffs; Sir HORACE DAVEY, Q.C., Mr. WARMINGTON, Q.C., and Mr. CARPMAEL, for the defendants.

The ATTORNEY-GENERAL, in opening the case, said the action was brought by Messrs. Gadd and Mason, under a patent dated Dec. 12, 1888, against the Corporation of Manchester, in respect of an alleged infringement of letters patent for checking, controlling, and steadying gasholders.* He then briefly described a gasholder, and explained its use; and went on to remark that, in connection with the present action, it would be a very material matter to remember that gasholders had been in existence for something like 70 or 80 years, and one of the alleged anticipations dated back to the year 1823. It was quite clear that gasholders, as such, were in existence prior to that time. His Lordship might remember that there were round a gasholder a number of columns fixed at equal distances, and having girders or bracing round the top. There were also counterbalance weights for controlling the pressure of the gas, and taking off some of the dead weight of the holder. There was further this utility in the standards: There were against the sides of the holder wheels which ran in grooves against bearings on the columns, or there were wheels on the latter which moved in grooves on the side of the holder and restrained it. A very large number of anticipations—some 16 or 17 in all—ranging from the year 1823 to 1887, were to be put forward; but he did not propose to encumber his opening remarks by going through them. Before dealing with the plaintiffs' patent, he might state, as fully and fairly as he could, what had been done prior to the year 1888. As far back as 1823, Malam patented a device for a gasholder in which posts were not dispensed with. [The learned Counsel described the holder.] Between that year and 1887, although there had been a number of other inventions with regard to gas holders, none of them had dispensed with the columns. There were still posts standing at various points round a gasholder, which posts would be useful for the purpose of controlling the motion of the vessel by wheels, pulleys, gearing, or any other appliance which pressed against the post. All that had been done prior to 1887 was to improve the method of attaching the gearing to the holder, and connecting it with the surrounding columns. Many of the arrangements would not be applicable to telescopic holders. Side by side with Malam's specification, there were a number of others relied upon, consisting of various modes of applying steadying machinery to pontoons, or vessels of that kind; but it was not necessary to go into those at present, because it would turn out that they would not be anticipations. If they were, they would only be some selected instances. He admitted that there had been for more than 50 years past attempts to solve the problem of steadying gasholders. In the year 1887, Mr. Gadd and Mr. Mason invented a device which was an entirely new departure—viz., a gasholder without either standards or weights. They put on the side of the tank in which the holder worked spiral rails, and on the side of the holder small rollers which fitted into the gearing, so that the vessel twisted as it rose. The pressure of the wheels against the sides of the spiral rails checked the tendency of the holder to topple over, or cant. The invention was perfectly successful, and was an extraordinary departure, because it dispensed altogether with the columns which had been used before. Shortly after 1887, Mr. Gadd, who was not by any means satisfied that he had arrived at the end of the matter, commenced to invent again. As early as the end of 1887 and the beginning of 1888, he was still experimenting on further improvements; and this would be an important matter with reference to an allegation as to the first and true invention, and also as to novelty. During the year 1888, he designed the arrangement described in the patent of the 12th of December, which was the one now in question. The drawings were shown to Mr. Mason, who was unwilling that the patent should be taken out so soon, as he thought the 1887 patent was likely to be a success; and as a considerable amount of time and money had been expended upon it, he did not wish it to be superseded by something else. But, as not unfrequently happened in these cases, another gentleman was also thinking of Mr. Gadd's invention. It appeared that, about the 10th of December, a Mr. J. B. Terrace wrote to Mr. Gadd, intimating that he had an invention for gasholders, though he never made the slightest suggestion as to the details. In consequence of this letter, Mr. Gadd communicated with Mr. Mason; and they determined that, as other people were in the market, and they might be forestalled, they had better at once patent their improvement. He should have to satisfy the Court, by evidence, that what was subsequently included in the provisional and complete specifications had been thought of at that time. The new invention related to three forms of development of the 1887 patent. It would not be incorrect to paraphrase it by saying that in all cases there must be suspension of the holder from the base—getting rid of the columns—and that there was to be a girdle of mechanism whereby the tendency of the holder to twist or topple over was controlled. This idea was identical with Mr. Terrace's; but he (the learned Counsel) should prove that the design had been drawn months before by Mr. Gadd's son. That Mr. Terrace had invented it was common ground; but that Mr. Gadd had invented it long before Mr. Terrace would be proved by evidence. He was now solely dealing with the arrangement for controlling the holder by torsion; but there was another method which Mr. Gadd had at the same time designed—viz., by tension—which had identically the same function of correcting pressure due to any tendency of the vessel to topple over. The principle was this: Upon the curb or ridge were fixed little studs or brackets, to which was attached rigidly a rope. The pulleys ran round in pairs. Another design also made by Mr. Gadd before the provisional specification was lodged was for putting the corresponding gearing on the tank instead of on the curb. There would be some contest as to whether the invention, as claimed, was or was not described in the provisional specification. He understood that his learned friend, Sir Horace Davey, would contend that it was only put into the complete specification. The only function of a provisional specification was to define the nature of an invention. The specification described the improvement as relating to the construction of gasholders; and it had for its object the supporting of the vessel in its working position in such a manner as to allow of the external guide-framing being dispensed with, and yet give the requisite stability, although a modified form of framing might be employed. It was not denied that the racks and toothed wheels which were part of the arrangement were within the specification; but the defendants denied that the tensional gearing was. The question was really whether Mr. Gadd had sufficiently expressed it in the specification. There were passages from which it was not only clear that it was expressed, but the language could only, and did only, refer to tensional gearing. The wheels were to be mounted on suitable shafts or studs. A stud was a different thing altogether from a shaft. No doubt his Lordship would be told that, if studs were used, a tensional gear would not operate at all. They were to have toothed wheels, or the mechanical equivalents thereof. By having vertical racks, or their equivalents, to the outer face of the holder, the wheels might be geared by means of intermediate wheels, or by chain or link gearing. These things fairly indicated some difference from the torsional gearing, and pointed to tension. Mr. Gadd would state that the words referred to the design which he himself had previously made, and which he had explained both to his son and to Mr. Mason. He (the learned Counsel) was mentioning this mainly with reference to any question of *mala fides*; but when he came to the dry law on the complete specification, he should be able to show this was a development of the specification. On the original drawing [produced] his Lordship would see drawn, from point to point, some pencil lines, and three methods of gearing. These were drawn by Mr. Gadd at the time, to explain to his son the method of tensional, as distinguished from torsional control. Mr. Gadd saw Mr. Mason in the early part of 1888, and discussed the new arrangement with him. At the same time, he sketched a tensional design on a rough piece of paper; and Mr. Mason would say that the sketch fully explained the matter to him. The next thing to which he would call attention was that, on the 14th of December, a Mr. Pease took

* The arrangement constituting the subject of the action was fully described and illustrated in the JOURNAL for Sept. 24, 1889 (p. 599).

out letters patent for a tensional arrangement. No publication of this arrangement, of any sort or kind, was made until months afterwards; and Mr. Gadd would state that he never had the slightest idea of it until after he had perfected his own design. The complete specification showed the development of the provisional specification. The plaintiffs would have to satisfy the Court that the words in the provisional specification did refer to that which was invented, and that the complete specification was a fair development of those words. He thought nobody reading the provisional specification fairly could come to any conclusion but that the tensional arrangement was referred to, and that what was described in the complete specification was the mechanical equivalents referred to in the provisional specification. The claims were very simple. They were for the employment round a gasholder-tank of torsional and tensional gearing; in other words, there was communicated, by means of tensional or torsional gearing, a corresponding motion to every part of the gasholder—dispensing with the columns and with everything except what was upon the holder or in the tank. From a model of the defendants' gasholder which he had before him, it would be at once seen that, from a mechanical point of view, there was absolutely no difference. Instead of taking the rope continuously through, the defendants had a piece of dead rope on to which the running rope was joined. The expert witnesses would state that, having regard to the function of the tensional cords, and of the wheels or pulleys on the side of the holder or tank, there was no distinction whatever between what was described in the complete specification of Mr. Gadd and the infringement complained of. He thought it would turn out that the Corporation of Manchester were only the nominal defendants, and that the action was really being defended by the contractor, or by the gentlemen who had been opposing Mr. Gadd's patent. However, this was not material, because the question was what had the defendants used, and was it an infringement of the plaintiffs' patent? In the plaintiffs' specification, there were one or two other modifications—for instance, where the cords crossed one another. Returning to Mr. Terrace's invention, he did not know whether or not his learned friends were instructed seriously to allege that this was an anticipation of the plaintiffs' patent.

Sir H. DAVEY: Certainly.

The ATTORNEY-GENERAL said if his Lordship would look at the particulars of objection, he would find that on Nov. 17, 1888, Mr. Terrace wrote to Mr. Walker, Mr. Livesey, Mr. Paterson, and Mr. Gadd, stating what he was doing; the letter to Mr. Gadd concluding with the words that, as he might soon be going into the patent list, "he expected the matter to be kept very quiet." In every single case Mr. Terrace was writing confidentially; so that this could not be treated as a publication of his invention. The reason it was not patented was because he found out that Mr. Gadd had done it before him. They would see how far the defendants were justified in setting up a right on the part of Mr. Terrace; but, having regard to the whole of the facts, he thought the Court would come to the conclusion that the communications were of a confidential character. He had already mentioned the fact that, two days after the plaintiffs' patent, Mr. Pease, of Darlington, took out a patent for a tensional arrangement. Mr. Pease would be entitled to raise the question of whether or not Mr. Gadd was the true and first inventor. Upon this all he would say was that, if Mr. Pease was practically defending this action, and was behind the Corporation of Manchester, he had had the advantage of cross-examining Mr. Gadd and Mr. Mason. He had had the whole of his case thrashed out once, with the result that no effect had been given to Mr. Pease's allegation. From correspondence which was published at the time, he should be able to show that Mr. Gadd was referring to his tensional arrangement months before he ever saw Mr. Pease. It was suggested that there had been some publication of Mr. Pease's invention in the *Gas and Water Review* before the complete specification was filed; but the plaintiff had never been able to see the article. He would state in the box that he had never had a copy of it in his life; that he prepared his specification from his own development; and that there was no truth in the suggestion that he obtained any part of it from Mr. Pease. Hearing that Mr. Terrace proposed to patent something, Mr. Gadd became alarmed, knowing that he and Mr. Mason had perhaps unwisely delayed for eight or nine months, and kept secret, that which was known to them; and accordingly the provisional specification was at once sent to London to be filed. This was done within 24 hours of the suggestion being made that somebody else might be in the field. In the specification there was no claim of any sort or kind made in regard to the details of the gearing. All these details were old—they having been applied to a number of different things; but during the entire range of experience of gasholders, they had never been applied to anything in the way that Mr. Gadd had applied them. It was, in fact, a double invention—an invention of applying gearing to gasholders, and indicating a way in which it was applied. In conclusion, the learned Counsel said he felt sure that, in the end, his clients would not suffer from his having had to condense his opening remarks within a short compass.

Wednesday, March 30.

On the resumption of the case this morning, evidence was given on behalf of the plaintiffs.

Dr. *J. Hopkinson*, examined by Mr. MOULTON, said he had read the plaintiffs' specification. He described the structure of an ordinary gasholder, and said one or two had been made as large as 300 feet, while there were many 200 feet in diameter. In early days, the holder was supported by counterbalance weights; but now the gas was sent in under pressure, and this supported the vessel. Gasholders were kept steady by guides. The steadying of holders in rising and falling was of great importance. A three-lift holder might be 90 feet high; and the wind pressure on so large an area was necessarily very great. The holder was in unstable equilibrium; but the wind pressure was the most important element affecting the stability. The circular staging to carry the guides had to be the height of the holder when fully extended, and was therefore very heavy. Prior to plaintiffs' patent, in 1887, he knew of no other device for supporting the holder. In that patent the position of the holder was determined by its lower edge. There were two forms. In one there were on the side of the tank rollers which ran on spiral rails, and so the holder went up with a screw motion, turning round as it rose. In the other modification, the rails were on the holder instead of the pulleys. This he should not call a torsional arrangement, although the holder twisted in its rise. It was a geometrical rather than a mechanical twisting. Torsional gearing was a means by which power was transmitted by the twisting of a shaft, as in cog-wheels. There was also torsional action with a flexible shaft, as in a dentist's drill. In tensional gearing, the power was transmitted by the direct pull of a rod, rope, or chain. The specification of 1888 now sued upon first stated the object—viz., to enable the upper guide-framing to be dispensed with, and yet secure the requisite stability. Witness described one way of doing this with certain variations. There was a model in Court showing one method described. On the gasholder were fixed a series of racks in a vertical position, eight in number. On each of those ran a toothed wheel carried on shafts running in bearings on the rim. Being connected in pairs on each horizontal shaft, the toothed wheels could only turn at the same rate; and this being similar with each pair all the way round, no portion of the holder could rise higher than any other. Every point must rise to the same height; and it rose, not with a screw motion, but with a parallel vertical motion. The same principle would apply to a two-lift or a three-lift holder. In the converse case, which was described in the plaintiffs' specification, the racks would be fixed in the tank, and the pinions were attached to the holder at the lower part. The form shown in figs. 1 and 2 of the provisional specification referred to such a method. That specification indicated that certain modifications might be employed; for instance, mechanical equivalents for the racks and for toothed wheels. In his opinion, there was nothing in the complete specification not properly included in the provisional; they were all adumbrated there. Two distinct forms of torsional gearing were shown: In figs. 1, 2, 3, and 4, pinions carried on shafts; and in figs. 5, 6, 7, and 8, one of a different kind, but still torsional—there being fixed on the holder nuts in which worked vertical long-pitched screws, each of which carried at the top a bevelled wheel, which geared into two other bevelled wheels carried on a horizontal shaft, and so it was rendered impossible for one of the nuts to rise to a greater height than another, because they were connected together through these screws and wheels. Figs. 9 and 10 showed another arrangement, in which both torsional and tensional forces came into play; chains being introduced. Figs. 11 and 12 showed a method in which ropes were attached to the holder carried under rollers on the tank up to the top of the holder, and down again in such a manner as to preserve its equilibrium. In another form, the ropes were fixed to the tank instead of to the holder; but the effect produced was exactly the same. Models showing the application of these different methods were exhibited, exemplifying the various modes in which the ropes might be carried. They were all equivalents for one another, and were fairly included within the provisional specification. Witness said he had had a drawing made, following one of the alternatives in the provisional specification; and it was practically identical with one of the models produced. [Witness explained this drawing to his Lordship.] The other figures could be dealt with in the same way; chain gearing might always be substituted for racks and pinions—they would produce the same effect. So far as he knew, the invention was novel at its date; and it was useful. He had not seen the infringing gasholder—only a model and a drawing of it. A model was produced; if that was correct, it was an infringement of the plaintiffs' invention. The sole difference was that at the top there was a rope which ran round the gasholder, and to this rope the vertical ones were attached. The existence of that circular rope round the top did not make any material difference. The directions in the plaintiffs' specification were quite sufficient to enable the invention to be carried out.

Cross-examined by Sir H. DAVEY: Gearing was any instrument by which power was transmitted from one point to another. That was in its broadest sense. He should describe a driving-belt as gearing, because it imparted motion. *Prima facie* it meant some device by which the motion of two parts were connected together or imparted from one to the other. He knew Spon's "Dictionary of Engineering." Counsel having read from that work a long definition of the word "gearing," witness said he did not consider it adequate, as it assumed throughout that one element had a circular motion, which he should not regard as necessary. He could not mention any book on mechanics in which this was not referred to as one of the elements.

Justice KEKEWICH said he had referred to the "Century Dictionary," in which the definition was wider—"parts collectively by which motion communicated to one part of the machine is transmitted to another." This seemed to sweep up a good deal.

Cross-examination continued: The word "gearing" was undoubtedly a little ambiguous. It was sometimes used in the narrower, and sometimes in the wider sense. He should describe as a "gearing" a rope used to pull up something; but he could not refer to any book in justification of that statement. The word "rack" was perfectly clear—a straight bar with teeth cut upon it, in which a toothed wheel worked. Turning to the plaintiffs' provisional specification, and comparing it with the beginning of the one of 1887, they were, he held, practically identical. The patent was for the means of effectuating the object therein described. It was contemplated that the upper guide-framing might still be employed, if desired. The specification referred to vertical racks, or any mechanical equivalents, attached to the tank. Anything attached to the tank which would guide the holder vertically would be an equivalent. The vertical screw would be one. The nuts on the holder worked in the thread of the screw, and converted vertical into circular motion. In the model with the ropes, those ropes were a mechanical equivalent; it effectuated the same object, and, broadly, in the same way. The words must be taken in connection with the subject-matter. Fig. 7 was an arrangement of cog-wheels round the base; all the wheels being mounted on studs. In the other figures they were mounted on shafts. Witness was then cross-examined as to the mechanical equivalents of pinions and mitred or toothed wheels; and he said that a nut in which a screw worked would be an equivalent. He should consider it meant the next link in the chain of connection between the tank and the holder. He pointed out, on the model, the portions of the rope which he allocated as the mechanical equivalents of the rack and of the pinion respectively. He did not say that any mechanical

engineer would have seen that these things were included in the provisional specification; but when he saw the latter, he would see that it was included. Every variation by which the object of preserving the horizontality of the holder was effected was not within the specification; it must be a parallel vertical action, and supported from the base, where the patentee dispensed with the framework. He should not say one piece of a continuous rope geared with another portion of the same rope, but, taking it broadly, the ropes and pulleys were the equivalent of the rack and pinions. The provisional specification contemplated the pinions all being geared together, so causing the whole circumference to rise at the same rate. In the rope arrangement, the pulleys were merely to save friction. In figs. 11 to 14 there was no case in which one wheel was connected with another by chain or link gearing, as mentioned in the provisional specification. Asked if any mechanical engineer, reading the provisional specification, would gather that the nature of the plaintiffs' invention was to steady and preserve the horizontality of a gasholder by means of an endless rope passing round four pulleys, as shown in fig. 16, witness said he did not think the words would induce an engineer to put that construction on it, but he considered that it was included. The complete specification was fuller in its description, and introduced the words "vertical chains or bands passing over or between pulleys or wheels at or near the bottom of the tank." He gave as an equivalent of a toothed wheel "a notched wheel, or in some cases a plain wheel." He referred to "the peculiar character of the invention, which consists in connecting, by means of torsional or tensional gearing, a number of points round the bottom curb of a gasholder in such manner that, when one point thereof tends to rise or fall, the same tendency is transmitted through such gearing round the circle to every other point." "Torsional gearing" was a perfectly accurate expression, though he could not say he had seen it before. He could not suggest any mode of accomplishing this object which could not come within those words. The word "gearing" was employed in the broad sense; he did not think it was in a different sense from that in which it was used in the provisional specification. The rope by which a pail was raised from a well was gearing, though an engineer, if he wanted to be descriptive, would not use this term. He should not call electric wires gearing; one must have some actual mechanical motion in the elements which formed the gearing. The provisional specification adumbrated the invention shown in figs. 11 to 16, but did not clearly describe it.

Justice KEKEWICH: If a man independently arrived at the invention shown in figs. 11 to 16, and then read the provisional specification, would he say, "I have produced one of the mechanical equivalents pointed at in that?"

Witness: I think he would, almost; but it is very difficult to say, because it certainly is not there described. He would see that it effectuated the end aimed at.

Cross-examination continued: The method described in the specification of 1887 was altogether different; when there was a tendency to rise on one side, the spiral on the other side pressed on the under side of the roller, and made it rise equally. The witness was then taken to the alleged anticipations, the first being Malam's. [A model of the top lift of the Manchester gasholder, which was alleged to be the infringement, was here admitted by Sir H. Davey to be correct, and was put in and marked X.] Malam's patent was taken out in 1823. The counterbalance weights were abolished long before plaintiffs' patent; but they were in use in Malam's time. They involved the use of columns to support them. Malam's object was the same as plaintiffs'. He used three or more shafts with pinions at their outer extremities, taking into racks on the interior of the columns. At the central point they were all geared together; so that, when one side of the holder rose or fell, it caused the shaft to rotate, and by gearing into the other two shafts in the centre caused them to rotate, and so raised or lowered their exterior ends and caused the whole holder to rise or fall horizontally. This was a mechanical equivalent to Gadd and Mason's rack and pinions, effecting the same object but in a different way, and was put in a different position. If it were put underneath the holder instead of on the top—which could not be done with a large holder—it would be more nearly equivalent. It might perhaps be used in this way to steady the top lift, if it could be carried—which he doubted; but subject to correction, he did not think it could be used for the bottom. The columns were used to carry the balance weights; they might have been dispensed with for that purpose if the weights were let down into a pit, that would not require much invention. It would not require very much invention to put the racks inside the pit; but he did not think the horizontal shafts could have been carried underneath the holder to meet in the centre gear-box. [A model of Malam's holder was put in, and another model in which the gear and shafts were placed underneath the holder.] This was an exact equivalent of the plaintiffs'; but it would not be applicable to large holders. It would be in a mechanical sense the plaintiffs' arrangement. It would operate as the top lift of a telescopic gasholder. He had not seen the actual Malam gasholder at Grantham or elsewhere. The columns would not be necessary in that model if the balance weights were not required. The picture of the Grantham holder seemed to be in accordance with the specification. Having four points, connected in pairs by shafts, would be substantially the same as three converging in the centre. Wild's patent of 1850 was next dealt with. It had reference to dock gates and caissons working vertically in guides in the side of a dock. It consisted of a caisson, made in four air-tight compartments, which was filled with water and sunk, and a ship floated over it. Air was then pumped in to expel the water, and the caisson rose, raising the ship with it for repair or examination. Such a structure would be in unstable equilibrium, and the method of keeping it horizontal was described, consisting of pinions on shafts, working on racks; and various other modes were referred to. The instrument was the same as that described by the plaintiff. The caisson was analogous in a general way to the gasholder. There were mechanical differences; and the forces to be provided against were different. There was the vertical pressure of the ship in the one case, and not in the other. The object aimed at was the same; and the means employed were the same. A competent engineer, having in his hand Wild's specification, would probably be able to apply it to the case of a gasholder. He had never seen the gasholder at Staindrop, in Durham. On a model being shown him, he said it achieved the same object as the plaintiffs'. There were ropes attached to three points of the holder brought up over pulleys, and all attached to one weight. As a mechanical problem, it was the same as the plaintiffs'; but there were certain important differences in the way in which it was carried out. He had seen Hanlon's American patent—it was in substance the Staindrop holder duplicated. Nicholson and Cole's patent was for a portable gasholder for use in railway carriages, with flexible sides and rigid top and bottom. It provided for the horizontal descent of the diaphragm or top, by means of cords and pulleys; and it was similar to the plaintiffs' fig. 14—the same principle, undoubtedly. A reasonably skilful engineer with this in his hand would be able to apply it to an ordinary gasholder by strengthening the cords or using chains; it was all old mechanism applied to a new purpose. Hayward's American patent, of which a model was produced, was practically the same thing over again. The last alleged anticipation was Standfield's patent, of 1883, for floating docks, hydraulic lifts, pontoons, &c.; but he said it was applicable to any other kind of platform which required to be kept horizontal. Fig. 21 there was identical with one of the elements in fig. 16 of the plaintiffs'. There was no question of mechanical equivalents. It was exactly the same thing, and used for the same purpose, in the sense of preserving the horizontality of the structure. In Gadd's case, the forces to be provided against were quite different. With a gasholder, there was practically only wind pressure to be dealt with—lateral pressure. In all the other cases, the disturbing pressure was vertical. He did not draw a distinction from the fact that the plaintiffs' had to be used in several sections; but it had to be arranged symmetrically round the holders. The invention consisted in the application of the means to a particular object. He had seen Sir Frederick Bramwell's paper on the St. Thomas's Floating Dock. In that case, there would be a certain surface exposed to the wind, but nothing like that in a gasholder.

Re-examined by Mr. MOULTON: The claim in plaintiffs' patent was for torsional gear arranged round a gasholder. That was an important matter, as contrasted with crossing over the top, especially in large holders; and it was essential for telescopic holders. In Nicholson and Cole's patent, the arrangement was diagonal; the element of mechanism was the same, but was applied in a different way. In the plaintiffs', the various elements passed the strains on from one point to another all the way round. In Hayward's patent also the strains were taken straight across from one point to the opposite one. In Malam's torsional gearing, the same thing occurred—it was carried over the top. Malam's patent could not, he thought, be applied to the middle or bottom lift of a telescopic holder—it was not directed to doing away with pillars. In the Staindrop arrangement, the force counteracting the wind force was limited by the weight employed; in the plaintiffs', the whole weight of the holder was utilized in that way. A man would not pass from that to Gadd's without invention. In Wild's patent, there was a long shaft along the side of the pontoon, with pinions at intervals gearing into racks on the wall of the dock. In none of the anticipations was there anything to suggest the application to a gasholder. Questioned as to whether invention was required to go from one to the other,

His LORDSHIP said he declined to take the opinion of Dr. Hopkinson or anyone else on that question. He should be glad if he could.

Re-examination continued: A pitch chain and tooth-wheel was an equivalent of a rack and pinion. Several hypothetical questions founded on assumed alterations in the patentees' description were put; and the witness said they would work.

Sir H. DAVEY objected to this kind of examination.

His LORDSHIP said he did not think it was of much use; but he could not stop it.

Re-examination continued: The object of the invention was clearly stated in the provisional specification.

Mr. *W. Gadd* was the next witness. He said he was one of the co-patentees, and he was a consulting engineer, carrying on business in Manchester. He had given a good deal of attention to the question of gasholders, commencing in 1887. As far as he knew, the patent of that year was the first instance of a gasholder stayed against wind pressure without framework. After that he continued to give his attention to the matter, to see if he could find any other means of arriving at a similar result. In November or December, 1887, he made the second invention. In December, or the beginning of January, 1888, he instructed his son to make studies of the matter; and two drawings or sketches were made, besides one which was abortive. One only of those drawings had been preserved, which was made certainly before February, 1888. It bore some marks of his own upon it; but the greater portion was his son's work, who was then a student. He spoke of the invention to his son, and to Mr. Mason—to his son in December or the beginning of January, and to Mr. Mason in February—in his dining-room. He was conversing about the first invention; and said he was prepared with another. Mr. Mason was financially interested in the first patent. He explained to him how the new invention was to work; that he proposed to accomplish the same end as in the first by means of gearing at the base of the holder, so that the guide-framing might be dispensed with. He made some rough sketches on the margin of a newspaper—some racks and pinions, and some arrangements of ropes, similar to the one shown in fig. 12. He communicated to his son the nature of the invention generally and the torsional gearing; the notes on the drawing showed that, and also an indication of tensional gear. [The drawing was produced.] The question of applying for a patent was discussed with Mr. Mason; and he thought it better to wait a little, and push the first patent. The first holder on the system was erected at Northwich in 1890. In December, 1888, he received a letter from Mr. Terrace. It was dated the 7th; but he did not receive it until the 9th or 10th. He answered it on the 11th, saying he had applied for a further patent; and did not think any plan could be devised which would not be an infringement of one patent or the other. At the time, he had no idea of what Mr. Terrace's plan was. On the same day—the 11th—he sent up the provisional specification; and on the 13th, received the certificate. He subsequently learned Mr. Terrace's method, which was shown in one of the models. Nothing in the provisional specification came from

Mr. Terrace or any other person. Further correspondence ensued; and on Jan. 8, 1889, an article appeared in the JOURNAL OF GAS LIGHTING on Mr. Terrace's invention, which he replied to on the 15th of that month. He saw nothing anywhere which aided him in drawing his complete specification.

Thursday, March 31.

Mr. *Gadd*, in further examination by Mr. MOULTON, said the invention disclosed in the provisional specification was for guiding a gasholder without upper framing—placing in the base all the resistances to lateral pressure. Arrangements for that purpose were described, and mechanical equivalents were referred to. All the figures in the complete specification were a fair outcome of the provisional specification; and they could all be applied to telescopic holders. Before this he knew of no method for steadying from the base gasholders rising vertically. Arranging the tensional gear round the holder was an important point; it transferred the strain from one point to the other, and was much superior to a method which carried the strain across the top, which was impracticable for all but small holders, and would not do at all for telescopic ones. The devices shown on the second sheet of drawings were mechanical equivalents for those on the first sheet. In one case the force was transmitted by torsion through the shaft, in the other by tension. Rope gearing and belt gearing were common terms, especially in Lancashire; and the use of rope gearing in lieu of tooth-wheeled gearing was also very common. Dealing with the anticipations relied upon by the defendants, he said Malam's specification contained nothing that would lead a person to think he could dispense with the vertical framing, or that would suggest that the gearing could be put underneath the holder. He knew of no such arrangement existing anywhere; and it was generally thought that it was improper to guide a holder solely from the base. As to the Staindrop holder, it was suspended from columns, and balanced by one weight instead of several as in old forms. It was totally different from his own method. Hanlon's was very similar to the Staindrop holder. The chief object appeared to be to enable the pressure on the gas to be regulated; but the columns were the same as in the ordinary method. Nicholson and Cole's patent would not teach anyone how to keep gasholders steady from the base, without upper framing. The base was a fixture, and the top rose and fell like an accordion; and the cords were carried across, not round the circumference. In Wild's patent, there were long shafts round the side of the caisson, carrying pinions working in racks, one at the top and one at the bottom. They were not connected by bevelled wheels. Nothing there would teach a person how to keep a gasholder firm and steady. The elements of his appliance were all old. There were the same elements in Standfield; but the latter was only applied to platforms, and the top of the platform could not rise above the guides. There was nothing there to teach a man how to apply the principle to gasholders without invention. The defendants' model had been made from drawings supplied by them, and was an infringement of his patent.

Cross-examined by Sir H. DAVEY: The Patent Gasholder Syndicate consisted of himself and Mr. Mason. An advertisement in the JOURNAL OF GAS LIGHTING in February, 1890, headed "Revolution in Gasholder Construction," was inserted by the Syndicate; the statement, "our alternative arrangement of torsional and tensional gearing we do not now recommend," referred to the 1888 patent. It was not suitable for large holders. It was for small holders, when used in its entirety; and for the upper lifts of large holders. He was not aware of any gasholders being erected under the 1888 patent. The Syndicate proposed to carry on the business of making and supplying gasholders. The advertisement was repeated several times in 1890; he did not write the advertisement. He knew the JOURNAL well, and had written several letters to it. He took it in in 1888, 1889, and 1890, and generally read it. He wrote a letter which was published on Jan. 15, 1889, referring to Mr. Terrace's suggestion, in which he said "he could not advise its adoption except for very small holders." He should adhere to that still, except that he should omit the word *very*. On the 15th of October, there was another letter, in which he said: "We do not think, any more than does Mr. Bridge, that any of these variations are either so good as the spiral, or likely to be accepted with favour by gas engineers, except perhaps for small holders, or it may be added lifts to existing holders." He still remained of that opinion; it was useful for small holders, and for upper lifts of any sized holders. The drawing he produced yesterday was the only one made before the date of the specification which had been preserved. He was quite sure that one of the rough drawings he showed to Mr. Mason was an elevation of such a plan as was shown in fig. 12—ropes affixed to the base, and carried round. In a letter of October, 1889, he said his specification did not confine action to the bottom curb, although his studies led him to the conclusion that nothing was gained by leaving it. This expressed his view then and now. He thought he had detected in Mr. Pease's letter an attempt to limit the words "bottom curb" to one particular piece of angle-iron. The provisional specification he considered indicated the rope arrangement. It was not specifically mentioned, because he thought that was proper matter for the complete specification. He considered he had more than adumbrated it. It was clearly shadowed forth—a fairly-defined shadow. He showed clearly that the arrangement was for gearing round the gasholder-tank. Witness was cross-examined at some length on the wording of the provisional specification, and as to what were the mechanical equivalents of the arrangements specified. He did not agree with Dr. Hopkinson that the pulleys on which the ropes ran were merely friction pulleys; they were also points of resistance by means of which the force was transmitted, and therefore formed part of the gearing. A strained rope round a pulley he had always been taught was the equivalent to a rack. In figs. 12, 14, and 16, he thought all the wheels were geared together by the rope. He considered the tensional transmission of the motion by means of the ropes was equivalent to the torsional transmission by means of the pinions on the horizontal shafts. He could not say whether or not he agreed with every answer given by Dr. Hopkinson on this subject, because it depended on the definition in each case of the word "gear." The peculiar character of the invention was guiding a gasholder, by means of gearing at the base, in such a manner that every point should be raised together; it included any known mechanical device for securing the same end in the same manner. The object of the 1888 patent was expressed in the same language as that of the patent of 1887; but the method of this patent was not included in that. In that case the base of the holder was held horizontal by the spiral guides; the stress was communicated by the holder itself, acting as a girder. The patent of 1888 was for a means of effecting a known object. He regarded it as an alternative method of attaining the object aimed at in the 1887 patent. Being a patent agent as well as an engineer, he drew his own specification. He did not think it necessary to describe more particularly the tensional method of carrying out the invention. It included three methods—torsional, tensional, or a mixture of the two. Any method included in these would be within the patent. Since 1887 he had given much attention to gasholders. In March, 1889, he did not, so far as he recollected, hear that the Corporation of Manchester desired to add a lift to one of the gasholders at the Rochdale Road works. He did not remember seeing an advertisement for tenders. He knew the firm of Messrs. Ashmore, Benson, Pease, and Co., Limited; and they were large manufacturers of gasholders. He knew that Mr. Lloyd Pease applied for a patent two days after his own application. He had read the complete specification, which described a means of effecting the same object as that in his own patent by ropes and pulleys. The infringement was in substance in accordance with Pease's patent. He knew nothing about the contract with the Corporation, or the arrangements Mr. Pease made with them, or that a model was sent to the Gas Committee which was placed in the Town Hall for public inspection. He never heard of it till that moment. If he had heard of it, it would have interested him; but he had never heard anyone mention such a thing. There were newspapers in Manchester, and they fully reported the proceedings of the Corporation. He could not say he always read them, not even when they dealt with gas matters. He had been informed that Messrs. Ashmore erected the holder of which he complained as an infringement. He never read the *Gas and Water Review;* he did not know he had ever seen a copy. He did not therefore see an article in the number for April 20, 1889, describing Mr. Pease's invention, and models of it. Reverting to the alleged anticipations, he did not deny that the mechanism employed by Wild was the same as his own; but the structure was not analogous. The pontoon never rose above the guides in which it moved, though the ship upon it did. A gasholder was entirely different from a pontoon. It would require invention to apply Wild's mechanism in the manner he had done; but the problem to be solved was different. The invention came in in applying the mechanism to the base of a circular structure. He did not know of Wild's invention, but he did of similar arrangements. Standfield's was identical with one section of his fig. 16. But it was applied to lifts, floating docks, platforms, &c.; and he thought it would require invention to apply it to a gasholder. The change from a platform to a gasholder was not obvious.

Justice KEKEWICH remarked that the change was certainly not obvious to him; he could not see any at all.

Cross-examination continued: He thought the gasholder being circular made a difference. The bottom curb of the holder would not come under the description of a frame. In Malam's plan, he thought the ropes acted as guides. Malam probably placed the pillars there for the purpose of carrying the balance-weights. There would be no mechanical difficulty in putting his horizontal shafts under the holder; but the suggestion was never made until after this patent. He was quite sure that the rough drawing he had produced contained memoranda indicating to his mind the tensional arrangement; they would not indicate it to anyone else without explanation. He had seen the gasholder at Staindrop, and had talked to the Manager about it. He was much interested in it, as a matter of archæology. Ordinary separate balance-weights would have the same tendency, to a certain extent, to keep the holder horizontal. He had not seen the gasholder at Rotherhithe, but he had descriptions of it. While the top lift was rising, it was guided in the frame; when it became cupped, it formed a dome above the lower one.

Re-examined by Mr. CLARE: Malam's apparatus could not be attached to the middle lift of a telescopic holder. Wild's patent had the same elements as an old gasholder in a frame; it was supported top and bottom throughout its motion. The 1887 patent was quite different to the 1888 one. In the former there were no moving parts; the holder could not rise vertically; and therefore no part of it could do so. The strain was transmitted from point to point through the material of the holder itself, not by means of moving mechanism.

Mr. *Thomas Newbigging*, C.E., of Manchester, said that he had read the plaintiffs' specification, as well as that of Mr. Pease. They were identical in principle. The means of carrying out the invention could be considerably varied. The provisional specification referred to vertical racks fixed in the tank, or mechanical equivalents therefor. He should consider the vertical screw working in a nut, or the rope gearing, mechanical equivalents. He explained, with a small "fiddle" drill, the analogy between a cord passing round a pulley and a rack and pinion. He considered the methods described in the final specification were included in the provisional specification under the term mechanical equivalents. Until the 1887 specification was published, he knew of no means of constructing gasholders dispensing with the upper guides. It was a new departure, and a very beautiful one. There was an important difference in the 1888 patent, which provided for a vertical instead of a spiral motion. There were circumstances which rendered it desirable to obtain this vertical motion. He could not suggest any means by which Malam's method could be applied to the middle or bottom lift of a telescopic holder; and it was not suitable at all for the large holders of modern times. Nicholson and Cole's patent could not be applied to a telescopic holder; the ropes passed underneath from side to side, and the holder to which it was applied was totally different. In his opinion, the principle involved in Wild's invention was different from that in the plaintiffs' patent; and the one would not lead to the other. The pontoon was guided in the same way as an ordinary gasholder, in a framework. Standfield's patent was similar to one of the elements in Mr. Gadd's invention; but it required invention to carry it out as he had done. The strains to be met were chiefly vertical in the one and lateral in the other. There was practically no resemblance between the Staindrop holder and that of the plaintiffs, beyond the use of cords. The whole efficiency of the arrangement depended on the

weight used; and there must be an external frame. In his opinion, no one could, without invention, have arrived at the 1888 patent from any of the prior specifications.

Cross-examined by Sir H. DAVEY: There was a great difference between Wild's patent and Gadd's. One was applied to a rectangular, and the other to a circular vessel, which he thought was a matter of importance. It would require some invention even to adapt the method to a circular pontoon; and, when so applied, it would still require invention to adapt it to a gasholder. There would have to be some alteration in the mechanism. In one case the centre of gravity was beneath the top of the guide-frame; in the other, it was always above the point of attachment. He agreed with what previous witnesses had said as to the similarity and differences in Standfield's patent. He did not consider the curb of the gasholder to be a frame such as Standfield referred to. Witness was then cross-examined in great detail on the subject of mechanical equivalents and the meaning of the word "gear." He considered the ropes geared into the wheels, and should not say the wheel geared into the rope; they were geared together.

Re-examined: There were important differences, from a mechanical point of view, between a pontoon and a gasholder. The one was a firm, strong structure, carrying a weight outside; the other, a very fragile one, supported by the gas inside it. This fragility had always been considered the obstacle to guiding it from the base only. Until Mr. Gadd's invention, he had never heard of any device for the purpose.

The further hearing of the case was adjourned till to-day.

The Crowland and Eye Gas Company, Limited, has been registered, with a capital of £5000, in £5 shares.

Exhibitions of Gas Appliances at Hanley and Tunstall.—Under the auspices of the British Gaslight Company, Messrs. John Wright and Co., of Birmingham, held an exhibition of gas appliances at Hanley during the week ending the 26th ult., and at Tunstall during the past week. Lectures on cooking by gas, with practical illustrations, were given twice daily by Miss Lewis, of the Nottingham Cookery School.

Wrexham Gaslight Company.—The annual meeting of this Company was held last Tuesday. In addressing the shareholders, the Chairman (Mr. W. Overton) stated that the consumption of gas was now at the rate of 60 million cubic feet per year; the increase in 1891 having been 3,553,300 feet. During the twelve months, they had erected a retort-house and put in some extra retorts; and the purifiers had been enlarged. It would be necessary to still further extend the works to meet the increasing demands for gas; and for this purpose the Directors would have to consider whether they would make additional calls upon the last issue of shares or raise the necessary capital by way of loan. The maximum dividends of 10 per cent. upon stock and 7 per cent. upon shares for the year were agreed to.

The Mersey Tunnel of the Liverpool Corporation.—The Water Committee of the Liverpool Corporation have resolved to recommend the Council to accept the tender of a London firm to at once construct a pipe (12 inches in diameter) through the Mersey tunnel for the sum of £750. This will really form one of the permanent lines; and the Committee therefore feel themselves justified in incurring the additional expense. If the Council accept the contract, there will in a short time be a supplementary supply of water sufficient to meet the requirements of the city. In connection with this subject, it may be mentioned that the men employed at the tunnelling works held a meeting last Saturday week in commemoration of the successful completion of the boring operations; and they took the opportunity of presenting the Contractors' Manager (Mr. W. Harlowe) with a silver cup as a token of the regard in which he is held by them.

Liability for the Cost of Cutting Off Gas Outside Premises.—At the Wandsworth Police Court last Wednesday, Mr. Henry Webster, of 62, West Hill, Wandsworth, appeared to answer a summons, at the instance of the Wandsworth and Putney Gas Company, for the non-payment of charges due from him. Mr. Dawson said the defendant refused to admit their servants to cut off the supply of gas, and they were compelled to cut it off outside the premises. If the defendant had admitted the Company's servants, the gas would have been cut off without cost. The defendant said he thought he was entitled to a notice. He had had a dispute with the Company about the deposit-money, which amounted to £5. The Company had held this money for three years, and he questioned their right to detain it so long. He asked the Company to accept the deposit-money in part payment of charges for the supply of gas; but they refused to do so. Mr. Dawson said 5 per cent. interest was allowed on all deposits. This system had proved of service to the consumer, as it had resulted in a reduction in the price of gas. The defendant said other Companies returned the deposits. Mr. Dawson said his Company were not bound by others. Mr. Denman made an order for the payment of the amount claimed.

Nottingham and the Water Supply of West Bridgford.—A numerously-attended meeting of the ratepayers of West Bridgford was held last Wednesday, for the purpose of considering the question of the water supply, and adopting a petition to the Local Government Board against granting to the Nottingham Corporation the Provisional Order applied for to include the district in their area of water supply. Mr. J. J. Hill, who presided, stated that an abundant supply of excellent water could be procured in the neighbourhood; and in support of this statement, he read a report by Mr. W. H. Radford, C.E., of Nottingham, who had drawn up a scheme, and estimated the cost, including contingencies, at £7000, and the working expenses at £250 a year. The income from water-rents at West Bridgford was at least £1100 a year. The Chairman also read analyses of two samples of the West Bridgford water from Dr. Percy F. Frankland; and said it was manifest, from the report and the analyses, that the boring for water had been an entire success, that an excellent supply could be obtained in the district, and at a considerably cheaper rate than they would have to pay to Nottingham. In the discussion which ensued, the speakers were entirely opposed to the supply by Nottingham, and in favour of the local scheme being carried out—the result being that it was resolved to forward a petition to the Local Government Board, pressing them not to grant the Order to the Nottingham Corporation.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Cannon Street Hotel, last Friday—Mr. JOHN BLACKET GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice calling the meeting, and the minutes of the last meeting; and the report of the Directors and statement of accounts for the six months ending Dec. 31, given in the JOURNAL last week, were taken as read.

The CHAIRMAN stated that, when he last addressed the proprietors six months ago, he was somewhat sharply taken to task for having ventured to pitch his remarks in too despondent a tone. They who lived in a criticizing age were all more or less the victims of irresponsible criticism. He honestly owned that although he felt sure he drew no alarmist picture of their future at the last meeting—nor had he felt it necessary to do so—yet at the same time he could not regard with feelings of pleasure the idea of withdrawing so large a sum from their undivided profits to pay the dividend. He also felt at the time that there was a certain amount of trouble and trial in store for them. He knew perfectly well that it was a subject of considerable congratulation that they had undivided profits upon which to draw in cases of emergency. These, however, were not like the purse of Fortunatus—they were not going to last for ever; and when, half year after half year, it was necessary to make such a large dip into them, one felt a certain amount of anxiety. At the back of their undivided profits, they had their £44,000 in Consols, which could also be used for similar purposes; and possibly the time might come when they would have to draw upon them. At the same time, it was the Directors' wish—and he felt sure it was shared in by the proprietors that they should keep as satisfactory an amount as possible in Consols. It was a good thing for the Company generally that they should do so; for it equalized prices, and kept them stable on the Stock Exchange. Passing to the accounts, he remarked that it was a long time since such an unsatisfactory statement had been submitted; but circumstances had been against them. In the first place, that which was of primary importance—their coal—had cost £5000 more than in the corresponding period of 1890. They had looked to coke to recoup them; but, unfortunately, coke showed a loss of £9000. So that in the past half year their coals cost £85,000, and they had only received back from coke £26,300, against £35,700 during the corresponding period of 1890. This was, to a certain extent, possibly to be accounted for by the bad state of the cement trade, those who were engaged in which were very large buyers of coke, and they had not been using so much of late. The Company had therefore had a considerable stock in hand; but they had always found that, when they paid high for their coal in the North, they had generally been recouped, to a certain extent, by their coke. What had happened in the past half year, in regard to this article, pointed to this fact—that, in common with other companies, they had, no doubt, paid more for their coal last year than they ought to have done, judging by the state of trade. They had paid a fictitious price. But they had been obliged to do so; and when he told the shareholders that 58 per cent. of the total expenditure was on coal, they would see how important it was to get this article at as reasonable rates as they could. But besides paying high for their coal, they had not received as good quality as they should have had; and they had had many complaints to make to their contractors for sending a great deal of dross and rubbish, which interfered with the working and the illuminating power of the gas. This was a subject which always gave their Engineer a certain amount of anxiety. He had been rather surprised lately to find in one of the local papers that the Mile End Vestry were so desirous of testing their gas, that they suggested to the London County Council the advisability of making a test on Sunday. The latter were only too happy to fall in with such a view. They therefore tested on Sunday; and he was glad to say the Company had come out scatheless. They had, however, been given no peace on the Seventh Day. This was certainly a "progressive" movement. In tar they had lost £700; but sulphate was rather better—showing an increase of £1300. On turning to the other side of the revenue account, more cheering figures awaited them. They found they had received £4800 more for gas in the past half year than in the corresponding period of 1890. This, he thought, was a very satisfactory feature, upon which one was glad to dwell. The stove and meter rental had produced £181 more; and they had now 3744 stoves on hire—being an increase of 349 in the half year. In short, it had cost £146,000 to earn £173,000. Their balance was therefore £27,666, which was carried to the profit and loss account; and if the proprietors desired the dividends suggested by the Directors of 13 per cent. per annum on the old stock, and 10 per cent. per annum on the new stock, it would take £18,336 from the undivided profits, and they would then carry forward £18,494. He regretted that it should fall to his lot to recommend the proprietors that day to take a somewhat reduced dividend. The reduction, however, was very moderate—only ¾ per cent.; but he felt, after great consideration of the matter, that it was without doubt a right and prudent course to adopt. Earning so much less than their dividend, he felt that there was no doubt that, as good business men, they should certainly make some slight reduction. Another thing had rather weighed with him. As he had said, they would carry forward £18,494. The current half year could not be a very prosperous one. At the present time they were in the middle of what was called the coal crisis, which necessarily gave them all more or less anxiety, although he was happy to tell them that their existing stocks of coal relieved them from any immediate cause for trouble. As, however, they had to pay rather a high price for the coal they were taking to supply the place of that for which they had contracted, the proprietors would see that at the end of the half year the charges would be somewhat higher; and therefore he had been desirous of seeing a sum carried forward which would be sufficient for their dividend next six months. After that, he hoped they would pull through. If they could only settle the unfortunate disputes in the North, and get their coal at something like reasonable rates in the summer, with the slight increase which had been made in their price, he hoped they

would be able in a year's time to produce more satisfactorily results than those submitted that day. He informed them at their last meeting, that they would not raise their price unless they felt that it was absolutely necessary to do so, and that it was good for the Company that it should be done. They had for long struggled to keep their price at 2s. 4d.—which had been for some time the lowest in the Metropolis—and they were also desirous of impressing on their customers that gas was the cheapest and the best illuminant in the world. It was therefore a matter of great regret to every member of the Board and the Engineer that it was absolutely necessary to raise the price by 2d. per 1000 feet. He hoped, however, that this very small increase would not interfere with their business; and he did not think that it could do so. The report told them that they had had a certain amount of stock unallotted, which had had to be sold for the benefit of the Company at the best price they could obtain. They asked the shareholders to tender; and they did so, the stock being allotted to them, at an average price of £197 1s. 5d. per cent., which was very satisfactory. The report said that it was necessary to raise £35,000 of debenture stock. They had already taken powers to do so; and therefore he need only mention the matter. They would see that, having depleted their undivided profits, which had been of the greatest use to them as a sort of floating capital, it was absolutely necessary to supply the place of these funds; and at the same time, the Engineer was somewhat desirous of increasing the storeage accommodation at their works to meet the increasing business. The £35,000 would be allotted *pro ratâ* at par to the shareholders, and it would have to be paid up on or before June 30 next; but full notice would be given of this. While on this subject, he desired once more to draw attention to the fact of how highly they paid for their capital. That day they recommended 10 per cent. on the £35,000 of 7 per cent. stock which they raised a short time ago, In days of prosperity, the Company did not feel the extra charge; and the proprietors were pleased enough to put the premium in their pockets. At the same time, it was a drain on the Company; and the proprietors must remember this, because they were so far differently situated from other companies who raised capital at large premiums which they put to their capital accounts. As to the future, it would be very unwise to prophesy regarding that which he could not possibly tell; but there were some satisfactory features connected with the Company. One was, he thought, their increasing business in the way of gas-rental, which was very satisfactory; and in the past half year they had carbonized 6000 tons more coal than in the previous half year. He hoped, therefore, that they would go on better when things settled down a bit. In their district they had 100,000 houses, out of which only 25,000 were supplied with gas. They had very often heard of the conservative working man; and probably many of them hoped that he would rather come to the front shortly. Whatever his politics, however, the working man was very conservative in the matter of lighting. He preferred his open range, with his dearly-bought coal, to the neat little gas-stove which the Company would be very glad to hire to him; and he also preferred his common petroleum lamp, with all its dangers, to cheap gas. By degrees, they would overcome this prejudice; and he hoped that in time they would derive a large rental from the 75,000 houses which they were not at present supplying. At all events, it would be their business to aim at this. Looking to the future, almost *the* question of the day was the labour question. It seemed to be everywhere with them. It was an unknown quantity; but it was a great factor in their prosperity. Mr. Livesey, at his recent meeting, remarked that we seemed to be approaching a time of armed peace or open warfare between capital and labour. He might mention in their own case that only a few weeks ago, as the newspapers said, "a bolt fell from the blue sky." Owing to some disagreement with coal men at King's Cross, the Company's Wapping works were not supplied with coal for about a week; because the men decided that they would not go to work until the dispute was settled. The Unions acted upon such dreadfully selfish motives that they never thought of the trouble which they inflicted on their own class, let alone upon their masters. If, however, they had no dispute with the labour market—and at present they were on amicable terms with their men—and if they got their coals on something like reasonable terms, he saw no reason whatever why they should not do better in the future than in the immediate past. Time, which settled all things, would determine this great problem; and he hoped before long that they would have more satisfactory accounts to present to the shareholders. He concluded by moving the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. Robert Jones) seconded the motion.

Mr. ENNIS said he was sure that the proprietors would endorse everything the Chairman had said as to the increase in the price of the gas. The advance was an exceedingly modest one; and he thought that no consumer should dissent from it in the circumstances. He was very glad to see that the Directors had had the courage to advance the price when they saw that it was necessary to do so.

The motion was carried unanimously.

Resolutions were passed, declaring the dividends recommended, and re-electing the retiring Directors (Sir J. C. R. Colomb, K.C.M.G., M.P., and Mr. J. G. Pilcher) and the Auditor (Mr. G. Ilsley).

Mr. R. H. JONES, J.P., then proposed a vote of thanks to the Chairman and Directors, which was seconded and unanimously agreed to.

The CHAIRMAN, in reply, observed that they generally met the proprietors and proposed either the same dividend or an increase; but on the present occasion they had had to meet them with a reduction. Nevertheless, the proprietors had received them with the same kindness and courtesy which they had always displayed towards them. He could assure them that they might rely upon the Directors doing their utmost to promote the prosperity of the concern. He afterwards proposed a vote of thanks to the Engineer and other officers.

Mr. ENNIS seconded the motion, which was adopted.

The ENGINEER (Mr. H. E. Jones), in reply, said that the Chairman had informed the proprietors that good relations existed between the Company and its employees; and he desired to state that the men who had specially inconvenienced the Company during the half year were in no sense the Company's men. The chief avenue for coal for their Company was the Regent's Canal; and the men there kept the dispute up after the "gentlemen" who originated the trouble had gone back to work. Where the quarrel began, it lasted three days; where it did not begin it lasted eight days. He received on every one of these eight days from the Secretary of the Union an intimation that he (the speaker) need not take any trouble, as all the men would resume work on the following day. They did not, however, do so; and it was quite clear to him that the Secretary of the Union had no more power over the men after the third day than he (the speaker) had. He desired to sit down with one pious aspiration—that was, that the Gas Companies would take one wrinkle from the Union; for the Unions were united and loyal.

The proceedings then terminated.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week, at Winchester House, Old Broad Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts, to which allusion was made in the JOURNAL for the 22nd ult.

The CHAIRMAN, in moving the adoption of the report, referred first to the revenue account—remarking that, if it was compared with the account for the corresponding period of 1890, it would be seen that in the Michaelmas quarter the receipts increased by £127; and this implied a steady increase of business of a new kind. Then in the Christmas quarter, the receipts were £119 in excess of those of the last three months of 1890. Recollecting the character of that winter—its severity, and the demand there was for gas—he should have been contented if they had held their own, and done a similar amount of business; but it was very satisfactory to find that they had had an increase. Altogether the revenue had advanced by £258; and this, in a small Company like theirs, was very important. Looking at the expenditure side of the account, they would naturally expect to find that the item of coals had increased; and he might here observe that they had sold an additional million cubic feet of gas. The coal account had gone up by £202; wages were a little higher; and maintenance of works was £47 more. Thus nearly the whole of their increased revenue had been expended. The result of the half-year's working was a profit of £1689. In the course of further remarks, the Chairman said that the unaccounted-for gas was something less than 4 per cent.; and considering the character of their district, in which they had miles of mains upon which there were very few consumers, he thought this was extremely satisfactory. The illuminating power and the quality of the gas had been well maintained above the parliamentary requirements; and they had not received a single complaint from their customers during the half year. Having referred to the prospects of the district, which he thought were good, he remarked that in the first paragraph of their report the Directors recorded, with sincere regret, the death of the Deputy-Chairman (Mr. John Chapman), who was the largest proprietor in the Company, a Director from its formation, and was always greatly interested in its progress and success. The shareholders might well imagine the painful thing it was to the Directors to learn that their good friend, the founder of the Company, had been removed from among them; and he was sure that they would all deeply sympathize with the family. Their Engineer would now become, in place of his father, the chief proprietor in the Company; and at present the Directors did not recommend that the vacancy on the Board should be filled.

Mr. A. H. BAYNES seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. C. HORSLEY, a dividend was declared at the rate of 7½ per cent. per annum on the original "A" capital, of 7 per cent. on the first additional "B" capital, and of 5¼ per cent. on the second additional "C" capital, all less income-tax.

The retiring Director (Mr. A. H. Baynes) and Auditor (Mr. F. G. Fenton) having been re-elected,

A vote of thanks was passed to the Chairman and Directors, on the motion of Mr. J. RANDALL, seconded by Mr. FENTON.

A similar compliment was afterwards paid to the Engineer and Secretary and the staff.

Mr. CHAPMAN, in acknowledging it, expressed his thanks for the sympathetic remarks which had been made in the course of the proceedings regarding the great loss which his family had sustained.

The proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY and MANAGER (Mr. W. F. Cotton) having read the notice convening the meeting, the report and statement of accounts for the six months ending Dec. 31 last, which were summarized in the JOURNAL last week, were presented.

The CHAIRMAN, in moving the adoption of the report, expressed his pleasure at the satisfactory state of the accounts accompanying it, which showed a profit sufficient to allow the declaration of dividends at the rates of 10½ and 7½ per cent., and leave a balance of £334. Passing on to refer to the working, he said that 61,732 tons of coal had been carbonized; being 2070 tons more than in the six months ending Dec. 31, 1890. The cost of this extra raw material increased the expenditure by £4950, not only on account of the larger quantity of coal used, but of the enhanced figure at which it had to be purchased—1s. per ton more than in the corresponding period of the preceding year. Wages, of course, had risen with the greater bulk of coal dealt with. On this account, there was an addition of £1730. On the other hand, the quantity of gas sent out had very considerably augmented—being 646,153,700 cubic feet, or a rise of about 20 millions. The receipts consequently showed an increase of £3385. This, he was pleased to state, was largely due to the extended use of gas-engines, and to the additional

number of gas-stoves employed for both heating and culinary purposes. From July, 1890, to the present date, the Company had sent out 242 cooking-stoves and 232 heating-stoves. The residuals did not show quite so favourable a result as before, in consequence of their market value being less. The Directors anticipated that, with improved trade, the value of these articles would have an upward tendency. Many gas companies had notified to their customers an intended increase in the price of gas to recoup them for the additional outlay they had had to incur. The Directors would, however, keep to the old rates as long as possible. With regard to the electric light, it was premature to offer any remark. Still, the Directors were confident that any revenue lost through its adoption would be amply made up by the increased use of gas in the directions to which he had alluded.

Mr. C. LAWLOR seconded the motion, and it was carried unanimously.

The CHAIRMAN next proposed the declaration of dividends at the rates of 10½ and 7½ per cent. per annum on the respective classes of shares; and this was agreed to.

The retiring Directors and Auditor were then re-elected; and the proceedings closed with a vote of thanks to the Chairman.

STOCKTON CORPORATION GAS-WORKS.

A New Gasholder—The Development of the Works.

A further important development of the Stockton Corporation Gas-Works was signalized last Tuesday by the laying of the centre stone of a new gasholder tank. On the invitation of Messrs. Holme and King, of Liverpool, the contractors for the tank work, there were a goodly number of the members of the Corporation present. When these had assembled in the centre of the huge excavation, Lieut.-Col. Holme requested Alderman Richardson, as Chairman of the Corporation Gas Committee, to lay the last stone to the tank, and concluded by presenting him with an appropriately engraved silver trowel and silver-mounted mallet. Alderman Richardson, in the course of a few remarks, said it afforded him extreme gratification to be the recipient of such a handsome trowel and mallet; and he was very pleased to state that the work had been carried out to the entire satisfaction of their Gas Engineer (Mr. W. Ford) and the Committee. The construction of the tank had taken no less than 20,000 tons of earth work, 5000 cubic yards of puddled clay, 300 tons of cement, 1000 tons of gravel and sand, and 1500 cubic feet of Ashlar masonry. The work had originated owing to the neighbouring town of Middlesbrough having been temporarily thrown into a state of darkness by an accident which deprived them of a supply of gas. The Stockton Corporation found that they had only a small quantity of gas in store; and to avoid the town being inconvenienced by the loss of light as in the case of Middlesbrough, this work had been entered upon.

The stone having been duly laid, the company had luncheon together. In responding subsequently to the toast of his health, Alderman Richardson gave some interesting particulars as to the history of the Stockton gas undertaking. He said that the works passed into the hands of the Corporation on July 27, 1857. In that year, the capital amounted to £20,451; in 1864, it was £21,742; in 1874, it was £30,793; in 1884, £109,204; and in 1892, it had increased to £132,856, which included what they had paid on account for the new gas tank, but did not include the completion of the contract. Then as to the make of gas. In 1858 it was 12 million cubic feet; in 1864, 20,891,000 feet; in 1874, 140,000,000 feet; in 1884, 257,053,000 feet; in 1891, 291,350,000 feet; and in the year ending March 31, 1892, 304,000,000 feet. With regard to the storeage capacity, in 1857 it was equal to 200,000 cubic feet; in 1864, 450,000 feet; in 1874, 650,000 feet; in 1884, 1,050,000 feet; in 1891, 1,323,000 feet; and in the present year, 2,293,000 feet; and with the new holder they would have a million cubic feet capacity more than before they undertook this work. Regarding the profits, since 1857 they had transferred to the borough fund no less a sum than £76,797. In addition to this, when the electric light first came up, there was a scare in the country, and they thought, as many others did, that it might damage their property; so they started a reserve fund, and since 1880 they had placed to that fund £16,967. Through a loss on the Corporation water undertaking, they had transferred £5000 of the gas-works profit to the borough fund; and they had expended £5813 on renewals, while they had a balance, which he might call a caution fund, of £6154. At the time the undertaking was transferred to the Corporation, the net price of gas was 3s. 10½d. per 1000 cubic feet. In 1863, they reduced it to 3s. 5d.; in 1868, to 3s. 2½d.; in 1870, to 3s.; in 1877, to 2s. 8d.; in 1881, to 2s. 5½d.; in 1882, to 2s. 3d.; and now it was 2s. He believed, with the exception of Leeds (which he thought charged 1s. 10d.) and one or two places in the Tyneside district, there was no other town in the kingdom where gas was supplied so cheaply as in Stockton. The smallest cottager in Stockton paid no more than the largest consumer for his gas. So, too, they dealt with their coke. Every ratepayer was charged the same, whether he purchased 100 tons or bought it in small quantities. In 1886 they did away with the charge for meter-rents, for which in the last year of their collection the substantial sum of £815 12s. 6d. was derived. This was equal to an additional reduction of rather more than 3d. Those were figures of which they might well be proud; and he could say, without fear of contradiction, that the works had been so well conducted, by having one who was unequalled in his ability as a Gas Manager. Before the proceedings terminated, Mr. Ford's health was also drunk, with musical honours. It may be mentioned that the contractors for the holder are Messrs. Ashmore, Benson, Pease, and Co., Limited.

ELECTRIC LIGHTING IN LONDON.

In our "Electric Lighting Memoranda" to-day, reference is made to a series of articles on the above subject now appearing in the *St. James's Gazette*, and especially to the third, given last Thursday, which contains some figures in regard to the cost of the new illuminant as compared with gas and oil. The following is the portion of the article alluded to.

At present the whole Metropolitan area, from West Kensington to Greenwich, is parcelled out among ten companies. Within these points, and from Swiss Cottage in the north to Battersea in the south, any house or other building can be supplied at a fixed price by the company having powers over the district. Just as gas is charged at so much per 1000 cubic feet, so current for electric lighting is charged at so much per Board of Trade unit, or B.T.U. A current of 1 ampère at a pressure of 1 volt is called a "watt;" and one hour's consumption of such a current is called a "watt-hour." The Board of Trade unit is 1000 watt-hours; and its price varies at present from 6d. to 8d. We shall say something presently about the comparative cost of electric lighting; but the householder who contemplates using it will understand from the above that, if he is charged 8d. per B.T.U., he is paying a full price, while 6d. is cheap and 7d. moderate. Taking London from east to west, the arrangements are as follows: The City, from Aldgate to Temple Bar, is supplied solely by the City of London Electric Lighting Company, Limited, which also has powers in Southwark. . . . . The system is a high-pressure alternating current, generated at two central stations, with transformer sub-stations; and the price is 8d. per B.T.U., subject to a sliding scale. The adjacent area westward is in the hands of the Metropolitan Electric Lighting Company, Limited, at present the largest of all these undertakings. Besides the Holborn and Strand districts, it has powers over the whole north-western area, including Marylebone, St. John's Wood, and Paddington. The growth of its business is a good measure of the progress of electric lighting. In March, 1889, the number of lamps connected was 3468; in 1890, they had increased to 18,721; in 1891, to 46,219; and in 1892, to 92,705. Since the beginning of the year, 11,256 lamps have been added. Four large central stations supply the current, which is alternating, of medium high pressure, and transformed down either at sub-stations or in the consumers' houses; the price is 7½d. per B.T.U. Whitehall is separately supplied by this Company on the low-pressure system. The south-eastern district is supplied by the London Electric Supply Corporation, Limited, which is the pioneer Company, formerly established at the Grosvenor Gallery. It has also concurrent powers with other companies over a very large area from Charing Cross to Knightsbridge and Chelsea. Consumers in these districts have, therefore, a choice of two sources of supply. The Electric Supply Corporation has initiated a very bold system. From an immense central station at Deptford, current is conveyed at very high pressure (10,000 volts) to various sub-stations, where it is transformed down to 2500 volts, and again to 100 volts at the consumers' houses. The price is 7½d. per B.T.U. The Company is passing through a period of trouble, and has to meet considerable competition. Consequently, though the plant is designed to supply 250,000 lights, and the engines now working are equal to 90,000, only 36,463 lights are connected, which is a decrease rather than an increase. One of its competitors is the Electricity Supply Corporation, Limited, which has powers over the parish of St. Martin's-in-the-Fields. Originally started as a private concern, it has grown by natural demand, and now supplies 22,000 lamps. The price is 7½d. per B.T.U. The neighbourhood of Regent Street and Piccadilly is supplied by the St. James's and Pall Mall Electric Supply Company, Limited, as well as by the Deptford Company. The former is a small but successful undertaking, with a connection of about 41,000 lamps. The low-pressure system is used; and the price is 7d. per B.T.U. We now come to a large area, including Mayfair, Belgravia, and Victoria, over which the Westminster Electric Supply Corporation, Limited, exercises concurrent powers. The low-pressure system is used; and the price is 8d. per B.T.U. Up to now, 72,555 lamps have been connected; showing an increase of nearly 50 per cent. during the last six months. Farther West, the Kensington and Knightsbridge Electric Supply Company, Limited, ministers to the well-to-do district indicated by its name. The number of lamps connected is 40,600—being an increase of 2200 since the beginning of the year; and the price is 8d. per B.T.U. Notting Hill, again, has a Company to itself, which has made steady progress since it started last year, and now supplies between 6000 and 7000 lamps at 8d. per B.T.U. Finally, there is the House-to-House Electric Supply Company, Limited, which supplies the Earl's Court district with some 20,000 lamps at 8d. per B.T.U. This business has also increased about 50 per cent. since last year. One London Vestry—that of St. Pancras—has started a supply for its own parish; and it will be interesting to see how this experiment in municipal lighting will work. The price to be charged is 6d. per B.T.U.; and it is hoped that this will prove sufficiently remunerative to render a rate unnecessary. A very good start has been made; all the lamps which the plant is capable of supplying (about 20,000) having been taken up since last November. In the foregoing account, lamps have been reckoned at 8-candle power each. In all, the number connected up to date is nearly 400,000, exclusive of private installations.

The prices mentioned above will enable consumers to compare one supply with another; but they give no idea of the cost of electricity compared with other sources of light. On that point opinions differ; but the following table embodies the results of a series of careful experiments carried out under ordinary household conditions. The gas-lamps compared are all of a superior order; common fishtail burners are much more expensive. The following is the annual cost of maintaining a light of 48-candle power—say, 2000 hours' burning (repairs and renewals included):—

Gas at 3s. per 1000 Cubic Feet.	
Argand lamps	93s.
Wenham lamps	41s.
Albo-carbon lamps	55s.
Welsbach incandescent lamps	30s.
Petroleum at 7d. per Gallon.	
Vulcan lamp	44s.
Small lamps	58s.
Electric Lighting.	
Incandescent lamps	245s.

These results will not please everybody; but the large relative cost of electricity must be discounted on several grounds. Even at present prices, however, consumers are generally satisfied that the light is well worth the money.

BRISTOL WATER-WORKS COMPANY.

The annual report of the Directors of this Company, a summary of which has already appeared in these columns, was presented for adoption by the Chairman (Mr. E. Bush) at the meeting of the shareholders last Saturday week. In the course of his remarks, he said there had been an increase of £3528 in the income during the past year; and this he considered highly satisfactory. The number of houses laid on, after deducting voids, was 1294. The number of services for domestic supply was 47,128, the total number of services altogether being about 50,000. He thought the policy of the Directors, in taking steps to obtain additional supplies of water, had not been commenced too soon. The shareholders would agree with him that the first duty the Company had to discharge was the ensuring of a good supply of water for the city. Since the filter beds had been at work—during the whole of last year—there had been practically no complaint. Having alluded to the number and size of the mains conveying water into the city, he said that the interest on the money expended in new works coming out of revenue accounted for the reduction in the dividend proposed by the Directors. The Chelvey works, which would soon be completed, would be an additional safeguard. They hoped to save a good deal of money in pumping, having storeage accommodation to the extent of 370 million gallons in the reservoir. Already they had effected a saving of £1300 for pumping, in comparison with the last three months of the previous year, which was something considerable. The Yeo Valley works had not made the progress the Directors had expected; but when they were completed, they would have a daily extra supply of 6 million gallons at a very moderate cost. The motion having been seconded, Mr. W. Latham said he was not altogether satisfied with the report. Notwithstanding that since 1888 there had been a large advance in the revenue, instead of there being an increase in dividend, it had fallen from 8½ per cent. in 1888 to 7½ per cent. He did not consider their prospects as rosy as they ought to be; and whereas last year they carried the large balance forward of £2057, this year it was only £849. He thought that, instead of looking forward to an increase of dividend, the prospect was that they would have a lower one. The Chairman replied that the charges in connection with the new reservoir which had come out of revenue represented at least 1 per cent. dividend. It was impossible to state off-hand what the cost of the Yeo works would amount to. The motion was carried unanimously. An extraordinary meeting was afterwards held for the purpose of authorizing the issue of £20,000 of preferred 3½ per cent. debenture stock; and the necessary resolution was agreed to

Gas Exhibition at Bury.—A very successful exhibition, to inaugurate the adoption of the hiring out of gas-stoves, was opened at Bury, last Tuesday, by the Mayor. The principal exhibitors were Messrs. Richmond and Co., of Warrington (who showed their "Model" ranges with enamelled tops), Messrs. J. Wright and Co., of Birmingham, and Messrs. Wilson and Sons, of Leeds.

Kimberley Water Company, Limited.—The report of this Company for the year ended Dec. 31 states that the accounts show a profit of £27,025. After providing for the interest on debentures, &c., there remains £20,703, out of which an interim dividend of 2½ per cent. has been paid; and it is proposed to divide a further 2½ per cent.—making 5 per cent. for the year—and to write off £4953 for depreciation.

The Vestries and the Increase in the Price of Gas in London.—At the meeting of the Chelsea Vestry last Tuesday, Mr. Brass stated that a deputation had waited upon the Directors of The Gaslight and Coke Company on the subject of the advance in the price of gas, but he could not promise very much as the result. The price would not be greatly increased; but the Directors could not promise that it would be reduced. At the meeting of the Poplar District Board of Works on the same day, a communication was received from the Clerk to the Chelsea Vestry, with copy of resolutions passed at a public meeting against the increase in the price of gas, and calling upon the London County Council to take steps to protect the consumers against the exactions of the Gas Companies; also expressing the opinion that the true solution of the conflicting interests of producer and consumer in what is now a necessary of life is to be found in the municipalization of the gas undertakings. Mr. Yabsley observed that the state of things in the district did not call for any special action. He would rather be in the hands of the Gas Company, with the regulations under which they worked, than in the hands of a body which already had ten times more than it could well undertake. He moved that the letter lie on the table; and this was agreed to.

The Longton Gas Undertaking.—In the JOURNAL for the 15th ult. (p. 492), reference was made to a comparative statement which the Gas Committee of the Longton Corporation had submitted to the Town Council in refutation of certain remarks made at a meeting of that body as to the management of the gas-works. The Committee obtained statistics in regard to eight gas undertakings owned by local authorities, and 15 owned by companies, having a sale within the limits of 15 million cubic feet above or below that of Longton. The averages of the local authorities, as already given in the JOURNAL, are as follows: Capital, £82,997; price of gas, 2s. 10¼d. per 1000 cubic feet; gross profits, £5013; net profits, £1018; quantity of gas sold, 80,801,688 cubic feet; gross profits per 1000 cubic feet, 1s. 2·9d. We now complete the statistics by giving the averages for the companies: Capital, £57,059; profit, £5193; price of gas, 3s. 1d.; quantity of gas sold, 86,278,104 cubic feet; profit per 1000 cubic feet of gas sold, 1s. 2·5d. The following figures for Longton show that that town does not compare unfavourably with the other places: Capital, £110,000; price of gas, 3s.; gross profits, £7183; net profits, £2234; quantity of gas sold, 85,405,300 cubic feet; gross profits per 1000 cubic feet, 1s. 8·52d. In noticing this matter in the previous issue, the gross profits were given as 1s. 5·2d. per 1000 cubic feet; but this represented the sum after deducting 1·75d. and a proportionate amount of meter-rental so as to place Longton on the same basis as the other local authorities. It may be pointed out that the net profits suffer through the heavy capital expenditure with which the concern is handicapped.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners had a little diversion on Monday—a sort of sparring match between Bailie Archibald and Mr. Kinloch Anderson—over the price to be charged for gas. The whole affair was no more than a practical illustration of how to get up much ado about nothing. Bailie Archibald moved that the price of gas remain the same as at present till the time for reading the consumers' meters in October and November; and Mr. Kinloch Anderson moved that the price of gas remain as at present until altered by the Commissioners. As it was quite clear that after May 15 no change could be made till October and November, and both were agreed that no change could be made at May 15, there was really nothing dividing the warriors. Bailie Archibald's position was easily understood. He wanted to wait till the annual balance is ascertained and the coal and other contracts fixed before approaching the subject of making an alteration in price. Mr. Kinloch Anderson read this to mean that they were only in September or thereabout to take up the question. That was nonsense; because Bailie Archibald's motion did not preclude the Commissioners at their July meeting, if they were ready, resolving that after October the price should be fixed at a certain sum. All that Mr. Kinloch Anderson contended for was that, as he expects a reduction to be made, it should be announced at as early a date as possible, and particularly before consumers began to consider what lighting agent they would be employing during the winter. That was a sensible proposition; but as it was conceded by Bailie Archibald, it was a pity that the Commissioners should have been divided on the subject. A division was, however, taken, with the result that Bailie Archibald's motion was carried by 14 votes to 5. The idea that it was necessary to have any motion on the subject arose, to my mind, from a mistaken reading of the Commissioners' Act. Section 79 of the Act of 1888, says: "The Commissioners shall from time to time fix the price to be charged by them for gas to be supplied during any succeeding year, half year, or quarter of a year; and until such price be altered by the Commissioners, the price so fixed shall remain in force." The last change of price was the advance from 3s. 9d. to 4s. 6d. for a year as from May last; and it was thought to be necessary to fix the price to be charged after May next, when the year would expire. The clause quoted does not bear any such interpretation. It merely forbids retrospective advances or reductions; and it states most explicitly that, a change having been made, the price fixed shall remain in force until altered by the Commissioners. Had they been able to read their own Act correctly, and had they exercised a little patience, they might have allowed the price of gas to remain untouched till they had disposed of the momentous questions which are already, by anticipation, troubling them.

In connection with the stoppage of Messrs. John Dobbie, Sons, and Co., Leith and Elliot, it is announced that the Committee of Management of the Arbroath Gas Corporation have had submitted to them by Mr. Tait, of Edinburgh, the Trustee of the estate, an offer to take the residuals produced at the gas-works from the date of the stoppage of the Messrs. Dobbie till May 31 next, at 4s. 1d. per 100 gallons; and that they have accepted the offer. The contract price was 6s.; so that the Corporation are losing 1s. 11d. per 100 gallons, and have left over for consideration the question of a new contract for the remaining two years of the term, or the taking of proceedings against the cautioner.

A Sub-Committee of the Dundee Gas Commission have given instructions to the Clerk to advertise for estimates for the proposed alterations at the Corporation Gas-Works. These consist of the laying of a cooling-main in the west retort-house, providing new exhausters, the inspection and repair of two of the gasholders, and the renewal of the sulphate plant. The Sub-Committee have agreed to recommend that, in regard to the sulphate of ammonia and chemical apparatus, a sum equal to a fifth part of the entire cost should be charged against the revenue for ten years; so as to have at the end of that period sufficient funds to renew the plant.

A proceeding which will be watched with interest has been instituted by the Board of Supervision with reference to the Fraserburgh Gas-Works. Residents in the neighbourhood of the works have made complaint that they are annoyed by the smells which emanate from them; and the Board have written requiring the Police Commissioners to furnish them with a medical report as to whether the manufacture of gas in the locality is injurious to the health of the neighbourhood, or is so conducted as to be offensive and injurious to health, in terms of section 16 of the Public Health (Scotland) Act. Although protest was made by one of the Commissioners that, by section 30 of the Act, gas-works are excluded from the operation of the statute, it was held to be necessary to procure and forward a report as directed; and a medical officer was appointed for the purpose. The question arises whether, should the medical officer be of opinion that the gas-works are conducted so as to be offensive to their neighbours, the Board of Supervision have power to require anything to be done.

In electric lighting matters, there are one or two items worthy of chronicling this week. The Edinburgh Corporation have resolved to ask the opinion of Counsel as to whether they are entitled to delegate their powers to a private company; and the Corporation intend to take advantage of the three years allowed by their Provisional Order before doing anything in the way of introducing the light, in order that they may get the benefit of the experience of other places. This is, it must be confessed, a very sorry position in which to place a great and advanced public question. It must be very disappointing to the promoters of electric lighting to find that their protestations of the great progress they have made are not believed; but it is, nevertheless, the true position to take up, if the interests of the community are to be considered. In Dundee a Committee of the Gas Commissioners have had plans of the buildings for their installation submitted to them; and they have sent them to Professor Kennedy for his opinion. This may be the right thing to do; but it looks like a waste of public money, considering that the plans submitted to him consist of little more than drawings of a few sheds. Messrs. Urquhart and Small, of Westminster, the electrical engineers for Dundee, have also submitted their plans of the plant they propose should be laid down; and these

have likewise been sent to Professor Kennedy. The engineers have adopted the low-tension continuous-current system, as recommended in previous reports by Dr. J. Hopkinson, and Professor Ewing.

The season is now approaching in which gas-works owners and managers must begin their inquiries after coal supplies for the next financial year. Among them all the question is whether coal is likely to go up or down in price. This is a subject on which each body will, of course, have to exercise their own judgment; but in that connection, I must say I do not see why, in these days of rings and unions, there should not be a combination among gas-owning bodies—a sort of co-operation—for the purchase and sale of materials. A Gas-Works Syndicate would be a good name to conjure with in the markets; and what a delightful revel would the gentlemen of the Stock Exchange have in its doings. To speak seriously, were such a thing attempted, these attendant circumstances would probably operate prejudicially to the gas industry; because, if the concern were made a large one, it would but add another link to the already long chain of middlemen who have planted themselves between the coal producer and the consumer. But laying aside the idea of combining in a speculative adventure, there would be great advantage in the owners of several gas-works uniting in the placing of their orders, and agreeing among themselves as to the distribution of their purchases—provided it were recognized that no profit was made by one works at the expense of the other. At present, there are numerous Associations of Gas Managers, which do much to educate the profession; why should there not be associations of owners, at whose meetings the state of the markets, labour questions, &c., could be discussed? Of course, it would require to be a condition of all such discussions that they should be held in private; otherwise the objects of the association would be defeated. This may be rather a Utopian notion, yet in these days of widespread combination and severe competition, something of the sort may come to be adopted for self-protection. At present, intending purchasers of coal may be almost certain that, if any change takes place, it will be in the downward direction. It would therefore seem to be the wisest policy to let coal contracts stand over for a little. There are indications of demoralization among the miners' organizations—a state of matters which, once begun, has always a tendency to spread with the speed of an epidemic; and everyone knows that, with the break down of the strongly-organized strike-promoting Unions of the miners, the adventitious prices which coal has commanded for the past year or two would soon dwindle away.

The local government of Glasgow is recognized to be in the hands of a Municipality which is as near perfection as any system of popular control can be. But the Municipality have the proverbial fly—in their case, it is unfortunately two flies—in their pot of ointment, which sometimes cause unpleasantness. These are the burghs of Partick and Govan, which, though in reality they form part of Glasgow, the Corporation have not yet succeeded in bringing within their jurisdiction. Both places are, however, supplied with gas and water by the Glasgow Corporation; and it is in connection with the water supply that the latest unpleasantness has arisen. In 1885, the Corporation obtained parliamentary powers which would enable them practically to double the supply of water which they take from Loch Katrine. Part of the scheme consisted of the raising of the surface of the loch by 5 feet, and the laying of a new line of main from the loch to the city. A large reservoir at Craigmaddie, which was to cost £250,000, was intended to enable them to store a 24 days' supply, was also included. The works under the new scheme have been in progress during the past six years; and a great deal of tunnelling in connection with the new pipe-line has been accomplished. At Craigmaddie, however, although excavations have been made to a great depth, a satisfactory foundation has not been found for the embankment of the reservoir. As time has advanced, too, various matters have cropped up which were not foreseen in 1885; and the Corporation are at present promoting a Bill in Parliament—a sort of omnibus measure—which is intended, among other things, to enable them to raise by mortgage a sum not exceeding £250,000, to sanction the time for the completion of the Craigmaddie reservoir being extended to July, 1897, to allow a deviation in the pipe-track, to provide water at high pressure for hydraulic purposes, and to give authority to agreements with the Duke of Montrose and other proprietors of land on the shores of Loch Katrine and Loch Arklet for the exclusion of feuing or building in the watershed of the lochs. These look innocent enough proposals, yet when the Bill came before a House of Lords' Committee this week, presided over by the Earl of Lauderdale, opposition was offered to it by the Police Commissioners of Partick and Govan. It is difficult to say what their objections were, for their case scarcely came on for hearing; the Corporation agreeing to insert in the Bill an undertaking that these independent burghs should not be prejudiced by any of the provisions of the measure. So far as can be seen, the only question in dispute was one of differential rates. Within the city of Glasgow, there is a public water-rate; but this does not exist outside, and in Partick and Govan the domestic assessment is 4d. per pound higher to make up for its absence. The Govan objectors made a general grumble that, while they were charged this extra rate, they did not get a sufficient supply of water—a position which they could not make good, and they were set aside. From Partick, the objection was that, it being proposed to levy an extra rate to cover the cost of pumping in connection with the high-pressure supply, the supply should be made compulsory in their district. They also wished to reserve powers to themselves with reference to the opening up of the streets. All the objections were, however, swept away, the general law being held to be sufficient to meet them; and the Bill, as proposed by the Corporation, was passed by the Committee. It is interesting to note in the evidence of Mr. J. M. Gale, C.E., the Water Engineer to the Corporation, that in 1891 they provided something like 42 million gallons of water per day for a population of 850,000; and that the supply to Govan was at the rate of 46 gallons per head per day. The proposed deviation of the pipe-track, Mr. Gale said, would involve the lengthening of some of the tunnels, but would shorten the route from 25¼ to 23¼ miles. They had in Glasgow 508 hoists and 93 hydraulic presses; and with the present pressure of from 45 to 50 lbs. per square inch, it was found that in the middle of the day, when these appliances were most wanted, the pressure fell off. What they proposed was, by means of pumping-engines, to send water into the city by two mains, at a pressure of 800 lbs. per square inch. The cost was estimated at £45,000. Another interesting piece of evidence was that of Sir Andrew M'Lean, Provost of Partick, who said that their principal street was even now very full of gas and water pipes; and there was, in addition, a subway running along its whole length, while there was a tramway line on the surface, and a Provisional Order was being asked for the laying down of electric lighting mains. This looks like taking a full use of the ground.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 2.

Sulphate of Ammonia.—There has been rather more doing; and the brighter weather is apparently beginning to stimulate the demand. If this be so, it may be expected that—the season being an unusually late one, and not much time left for farm work—there will be a sharp spurt during the first half of the month; and in view of the reduced stocks, and the comparatively small quantity on the market, a probable steady advance in prices. A similar feeling is becoming perceptible in nitrate, notwithstanding that, contrary to sulphate, the position is not at all favourable. Taking the nitrate figures on March 31, the consumption in Europe up to that date (since the beginning of the year) shows a falling off of about 100,000 tons against last year; but holders confidently anticipate that the April demand will compensate for this deficiency. Last year something like 125,000 tons were taken in April; and the visible supply, to meet a similar consumption this year, is a stock of about 120,000 tons, and afloat about 100,000 tons. Sulphate quotations are little changed—Hull and Leith being £10 5s.; and Liverpool, £10 2s. 6d. Nitrate is quoted at 9s. 1½d. per cwt.

LONDON, *April* 2.

Tar Products.—This market continues as flat as it can possibly be. Buyers hold aloof; and distillers are full up with stocks. The outlook is extremely gloomy; and prices continue weak, with an inclination to go lower. Some business is reported in anthracene; but at a wretchedly low price. Large quantities of common oils and naphthalene salts are being burnt; and it is claimed that, when used properly as a fuel, it is worth a penny per gallon at least, and considerably more where coal is dear. A little demand has sprung up for carbolic products; but so far prices have not improved. Heavy shipments of pitch are going on; but it is mostly, if not entirely, on old contracts. Prices: Tar, 12s. 6d. Pitch, 28s. 6d. Benzol, 90 per cent., 1s. 10d.; 50 per cent., 1s. 6d. Toluol, 1s. 4d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30 per cent., 10½d. Creosote, ¾d. Naphthalene salts, 20s.; pressed, 45s. Carbolic acid, crude, 60's, 1s.; 70's, 1s. 4d.; crystals, 4¾d. Cresol, 8d. Anthracene, 30 per cent., "A" quality, 11d.; "B," 8d.

Sulphate of Ammonia.—The better weather now prevailing should improve this market. So far, it continues lifeless; and £10 to £10 2s. 6d., less 3½ per cent., seems to be the outside value. Gas liquor (10-oz.) is nominally quoted at 5s. 6d. to 6s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The excessive buying which went on during the recent needless excitement in the coal trade is still to some extent being felt as regards the demand for nearly all descriptions of fuel. During the past week there was again but a very limited quantity of business; and although the better qualities of round coal, suitable for house-fire purposes, have been moving off fairly well, all descriptions of fuel for iron-making, steam, and general manufacturing operations, have been hanging upon the market. Supplies have been considerably in excess of requirements; and stocks are again accumulating at a good many of the collieries. For household coals, prices have been steady, at about 12s. 6d. per ton for the best descriptions, 10s. 6d. to 11s. per ton for seconds, and 9s. to 9s. 6d. per ton for common sorts. The generally depressed state of the iron trade is necessarily affecting the demand for the lower qualities of round coal for forge purposes, and these are difficult to dispose of; while the shipping demand for steam coal has also been extremely quiet. For inland requirements, steam and forge coals could now be bought at about 8s. 6d. to 9s. per ton at the pit's mouth; while for shipment steam coal has been readily obtainable, delivered at the ports on the Mersey, at about 10s. per ton. Engine classes of fuel are again plentiful in the market, especially in the commoner descriptions; and low figures are being taken to effect sales. Burgy does not average more than 6s. 6d. to 7s. per ton; the best qualities of slack, 5s. 6d. per ton—ordinary common sorts being readily obtainable at 4s. to 4s. 6d. per ton, and inferior descriptions, in some cases, at as low as 3s. 6d. per ton, at the pit's mouth.

Northern Coal Trade.—Despite the fact that for three weeks the Durham coal output has been stopped, prices continue to weaken. Northumbrian steam coal is quoted at about 10s. 6d. to 10s. 9d. per ton free on board, for best qualities; but contracts have been entered into at considerably less prices for future delivery. At the same time, it must be added that there have been sales for inland use at higher prices during the strike, though these were for comparatively small quantities. Second-class coals have ruled about 9d. per ton lower; and small steam coals have been sold at 4s. 6d. to 5s. per ton—a fair demand for manufacturing purposes having been known. The "fancy" prices for gas coal began to pass away when the other collieries in the country began to work; and in the course of the past few days, 12s. per ton, free on board, was quoted by the collieries that had ten days ago asked 14s. to 15s., and which had certainly made some sales at the lower of these prices. Sales, however, have been few—the production of gas coals being taken up in contracts mainly, and stocks at some of the gas works have been brought down; so that the resumption of work—which is not now far off—it is believed, will be looked for with some desire on the part of the local gas companies. Bunker coals have been much less in demand; hundreds of steamers having been laid idle, and

both the coal consumption and the labour market having been thereby affected. Manufacturing coal is dull—so many factories having been laid idle by the strikes. Coke seems to be now dropping in price from the high rates that have been quoted of late; but until operations are really commenced again at the coke-works, it is difficult to state rates. Gas coke is now produced in smaller quantities; and some of the gas companies have raised the price for retail quantities to the summer rates, but these are not likely to continue. Much, however, depends on the prolongation or otherwise of the Durham miners' strike. This appears to be hastening to an end; and there may be a more speedy resumption of work generally than was looked for a few days ago.

Huddersfield Corporation Water Supply.—According to a comparative statement of income and expenditure on revenue account of the Water Department, submitted by the Borough Accountant, at the last meeting of the Huddersfield Town Council, the profit on the financial year ending Feb 29, was £4024, as against £5754 in the preceding year. The income for the two periods was £48,650 and £47,295 respectively; and the expenditure, £44,626 and £41,540.

Lime and Oxide Conveyors.—A considerable number of experiments have been carried out from time to time with different types of conveyors for lime. At the Dawsholm Gas-Works of the Glasgow Corporation, two different designs were tried and failed. Towards the end of last year, however, Mr. Gilbert Little, of the New Conveyor Company, submitted to Mr. W. Foulis different designs of a lime conveyor, and the one approved by him is now working successfully at Dawsholm, as testified by Mr. A. Wilson, the Resident Engineer. The conveyor delivers right to the end of the trough (260 feet); and there has been no trouble with the large pieces of limeshell.

The Importation of German Gas Coal into London.—One of the two vessels laden with Westphalian coal for the South Metropolitan Gas Company discharged her cargo safely at the East Greenwich works on Monday last week, and left. The name of the vessel was the *Rosalind*, from Amsterdam. She brought from 1000 to 1100 tons, and was discharged by the Company's own men, who are non-unionists. The other vessel—the *Angelus*, from Rotterdam—laden with about 1000 tons of similar coal, was due to arrive shortly after. Mr. W. Thorne, the General Secretary of the Gas Workers and General Labourers' Union, admitted, with regard to the German coal, that the Union was powerless. He said he could not see, from the Trade Unionist point of view, that it mattered whether coal came from Germany or from Scotland.

Sales of Shares.—Last Wednesday, Mr. R. Mack sold by auction, at Newcastle, £25,000 of consolidated stock of the *Newcastle and Gateshead Gas Company*, to be issued under the provisions of the Company's Act of 1879. There was a large attendance. The stock was put up in lots of £100 each, nominal value, and fetched an average of £183 4s. 4d.—the total amount realized by the sale being £45,804 5s. The dividend is 9½ per cent.; and the Company have, by lowering the price of gas, obtained power to pay 9¾ per cent. At the last sale, in 1888, the average price realized was £187 1s. per cent.——At a sale at Leeds last Tuesday, £200 of stock of the *Newcastle Gas Company* was disposed of privately at £191 per cent.; and a further £200 at £191¼ per cent.—— Five £10 shares in the *Horncastle Water Company*, recently changed hands at £10 15s. each.——At a recent sale by auction at Southsea 28, £10 (1857) shares in the *Portsmouth Water-Works Company* realized £28 2s. 6d. and £28 per share; 10 £5 (1861) shares, £14; 52 £5 (1868) shares, £13 10s.; 17 £5 (1879) shares, £9 2s. 6d.; and 52 £5 (£3 10s. paid) (1883 issue) shares, from £7 to £7 5s. On the same occasion, three £53 shares in the *Portsea Island Gaslight Company* produced £112 10s. each; four £50 "B" shares, £105 10s.; and six £50 "C" shares, £100.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 616.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c.	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12—14	..	11 8 1
200,000	5	12 Nov.	7½	Bombay, Limited	5	6¾—6¾	..	5 11 6
40,000	5	,,	7½	Do. New	4	4¼—5¼	..	5 14 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	205—215	..	5 14 1
150,000	,,	,,	9½	Do. New	100	155—160	..	5 15 8
220,000	20	11 Mar.	11½	Brighton & Hove Original	20	39—41*	..	5 12 2
888,500	Stck.	11 Mar.	5	Bristol	100	95—100*	..	5 0 0
320,000	20	15 Oct.	11½	British	20	43—45	..	5 0 0
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14—15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	6—7	..	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	93—96	..	6 5 0
150,000	20	26 Feb.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	15 Oct.	13a	Commercial, Old Stock	100	244—249	..	5 4 5
165,000	,,	,,	10a	Do. New do.	100	190—195	..	5 2 7
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	121—226	..	5 15 1
200,000	,,	,,	10	Do. 7 p. c. Pref	100	185—195	..	5 2 7
75,000	Stck.	30 Mar.	10	Crystal Palace District	100	185—195*	..	5 2 7
486,090	10	29 Jan.	10	European, Limited	10	19—20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Feb.	12	Gaslight & Coke, A, Ordinary	100	212—217	..	5 10 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	244—249	..	4 0 4
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	169—174	..	4 6 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	150—154	..	4 10 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	241—246	..	4 1 3
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145—150	..	4 0 0
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—116	..	3 9 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118—123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	222—226	..	5 6 2
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	106-108*	..	4 12 7
541,920	20	27 Nov.	6½	Monte Video, Limited	20	14¼—15½	..	8 7 8
150,000	5	27 Nov.	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Mar.	7	Ottoman, Limited	5	4—5*	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2¾—3¼	..	—
				People's Gas of Chicago—				
420,000	100	3 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 Dec.	6	2nd Do.	100	100—105	..	5 14 3
150,000	10	15 Oct.	10	San Paulo, Limited	10	9—10	..	10 0 0
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	266—271	..	5 14 5
1,350,000	,,	,,	12	Do. B do.	100	220—225	..	5 6 8
200,000	,,	,,	13	Do. C do.	100	235—240	..	5 8 4
725,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	138—143	..	3 10 0
600,000	Stck.	11 Mar.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	225—235	..	4 5 1
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	191—196	−1	4 1 7
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	136—140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	94—97	+1½	4 2 6
708,000	Stck.	12 Feb.	10½	Kent	100	240—250	..	4 4 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	205—215	..	4 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	100	180—185	−5	4 0 0
260,000	Stck.	30 Mar.	4	Do. 4 p. c. Deb. Stk.	100	120-123*	+2	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	320—330	−5	3 13 6
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	133—138	+1	4 14 2
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	125—135	−12½	4 16 3
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	236—241	..	4 16 0

*Ex div.

a Next dividends will be at this rate.

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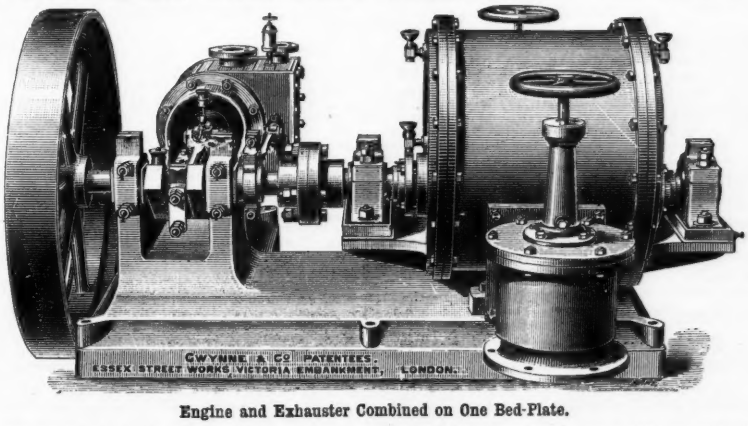

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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, ROGIES, and SMALL WAGONS.
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Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

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INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.
For prices and terms apply Botolph House, Eastcheap, LONDON, EC.

GAS-METERS FOR SALE.

THE Royal Agricultural Hall Company, Limited, Islington, have FOR SALE one 500-LIGHT DRY METER, and one 200-LIGHT DRY METER, which until recently have been used at the Hall, and are in good working order.
Apply to R. VENNER, Secretary, Royal Agricultural Hall Company, Limited, ISLINGTON.

NEWTOWNARDS TOWN COMMISSIONERS (NEAR BELFAST).

FOR SALE—A Set of Four Dry LIME PURIFIERS, 6 feet square by 3 feet deep, with 8-inch Hydraulic Centre-Valve and Connections, having Cover and Valve, and Lifting Apparatus on top of Centre-Valve.
Prices to Wm. Heron, Esq., Town Clerk.
Particulars from ALEXR. WADDELL, Manager.

ARBROATH.

CHEMICAL WORKS FOR SALE.

FOR SALE, by Private Bargain, as a Going Concern, the NORTH BRITISH CHEMICAL WORKS, at Elliot, near Arbroath, at present carried on by Messrs. John Dobbie, Sons, and Co., Chemical Manufacturers.
The Works were erected at a cost of over £7000, about two years ago, for the purpose of treating Tar and Ammoniacal Liquor delivered by the Gas Companies in the district. The Buildings are of a substantial character; the Machinery and Plant being of the most modern type and construction, almost equal to new, and thoroughly well adapted for treating a large supply of Tar and Liquor at a low cost. There is also ample space and facilities for the extension of the Works, if necessary.
The Works have been valued and reported upon by Mr. George H. Lord, of Dundee; and copies of his Report and Valuation may be had from the Trustee on the Firm's Estate. The Works cover an area of Three Acres, which are held in perpetuity from the Trustees of the late Earl of Dalhousie; the Feu-duty being only £18.
The Works are situated about ¾ mile from Elliot Junction, which is about 2 miles south of Arbroath, and are in close proximity to the Main Line of the Dundee and Arbroath Joint Railway, with a Siding into the Works.
A Purchaser might acquire the Stock at a valuation; and arrangements could be made for taking over the current Contracts with Gas Companies for supplies.
The Works can be inspected by intending purchasers on an order signed by
JOHN SCOTT TAIT, C.A., Trustee.
67, George Street, Edinburgh.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. III., centre of JOURNAL.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE, 173, Fentiman Road, LONDON, S.W.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps an other Apparatus for Gas Lighting, &c.

FOR SALE, cheap—Two Gasholders, 35 ft. diameter by 12 ft. deep. Capacity, 11,500 cubic feet each. Also various other larger sizes.
Two PURIFIERS, 24 ft. by 16 ft. by 4 ft. 6 in. deep, with Valves and Connections.
Four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep, 12-inch Centre-Valve and Connections. Also various other sizes.
WASHERS, from 500,000 to 250,000 feet per diem.
CONDENSERS, from 500,000 to 10,000 feet per diem.
EXHAUSTERS, from 120,000 to 5000 feet per hour.
STATION METERS, from 100,000 to 1500 ft. per hour.
Would erect any of the above, and make practically equal to new.
Inquiries invited for any second-hand Gas Plant.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

LEIGH LOCAL BOARD.

FOR SALE (cheap)—One 20,000 cubic feet per hour GAS EXHAUSTER and STATION METER, both complete with Valves and Connections.
Particulars from
A. T. FLETCHER, Engineer and Manager.
Gas-Works, Leigh, Lancs.,
April 1, 1892.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite TENDERS for the supply and delivery of about 600 feet of 21 in. by 15 in. MACHINE-MADE RETORTS, and a quantity of FIRE BRICKS and CLAY.
Particulars may be obtained from the undersigned.
Sealed tenders, endorsed "Retorts," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of April next.
The lowest or any tender not necessarily accepted.
ALFRED T. FLETCHER, Engineer and Manager.
Gas-Works, Leigh, Lancs.,
March 30, 1892.

THE GLASGOW ALUM AND AMMONIA COMPANY, LIMITED, IN LIQUIDATION.

TO BE SOLD by Public Roup, within the Faculty Hall, St. George's Place, Glasgow, on Wednesday, April 13, 1892, at 2.30 in the afternoon (unless previously disposed of), the WORKS OF THE ABOVE COMPANY, in West Street, Tradeston, Glasgow, immediately adjoining the Tradeston Gas-Works.
The Ground measures 5425 square yards; and from its situation, and having a Railway Siding, it is valuable as a Site for any kind of Works; but, for its present use, it is specially suitable, as the Residual Products of the Gas-Works are conveyed therefrom by Connecting-Pipes. The Buildings and Plant, which are extensive and substantial, and suitable for the business, include Ammonia Plant, Tar Plant, Pitch Oil Store-Tank, Naphtha Plant, &c.
Feu Duty, &c., £107 14s. 5d.
The Works are in full operation; but, in order to ensure a sale, the whole Property will be exposed at the upset price of £9000, which is about the value of the Ground apart from the Buildings.
For particulars apply to THOMSON M'LINTOCK, C.A., 88, St. Vincent Street, or J. M. TAYLOR AND FOULIS Writers, 180, St. Vincent Street GLASGOW.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

BOROUGH OF MOSSLEY.

OXIDE.

THE Gas Committee are prepared to receive OFFERS for about 160 tons of SPENT OXIDE, in good condition.

Samples can be had on application to the undersigned.

They are also prepared to receive TENDERS for the supply of 80 tons of NEW OXIDE, either by Boat or Railway Station.

Tenders (endorsed) to be sent to the Town Clerk not later than April 9.

RICHARD MERRELL,
Manager.

Gas-Works, Mossley,
March 23, 1892.

BOROUGH OF WARRINGTON.
(GAS DEPARTMENT.)

TO BUILDERS.

THE Gas Committee of the above Corporation invite TENDERS for the Erection of a GAS TANK and EXCAVATION for same.

Full particulars can be obtained on application to Mr. W. S. Haddock, Engineer to the Department.

Sealed tenders (endorsed) to be addressed to the Chairman of the Gas Committee, and sent in not later than the 21st inst.

The lowest or any tender will not be necessarily accepted.

FREDK. TAYLOR,
Secretary.

Gas Offices, Mersey Street,
Warrington, April 1, 1892.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the work necessary to be done in CONVERTING four 14 feet square PURIFIERS into two 33ft. 3in. by 14 feet, or thereabouts, with Covers complete.

Tenders to be sent in at or before Noon on Monday, April 11, addressed to the Chairman of the Gas and Water Accounts Committee, Gas-Works, Hardres Street, Ramsgate, endorsed "Tender for Alteration to Purifiers."

The Committee do not bind themselves to accept the lowest or any tender.

Specification and full particulars on application to

WILLIAM A. VALON,
Engineer.

CITY OF BIRMINGHAM.

TENDERS FOR AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the purchase of the AMMONIACAL LIQUOR produced at their Works during a period of Ten years, beginning on July 1, 1893.

The quantity produced in the year ended March 31, 1891, was 13,682,000 gallons of 10-oz. Liquor.

Provision may be made for dealing with the Liquor either in Works now erected on Land belonging to the Corporation, or on Land to be let for the erection of new Works.

Copies of the conditions on which tenders are invited may be obtained on application to

EDWIN SMITH,
Secretary.

City Gas Offices, Council House,
Birmingham.

BY ORDER OF THE EXECUTORS OF R. H. SWAINE, ESQ., DECEASED.

CROYDON GAS COMPANY.

Sale of 886 Shares in the Croydon Commercial Gas and Coke Company, producing Dividends at the rate of 14 and 11 per cent. per annum respectively.

THURGOOD AND MARTIN have received instructions TO SELL BY AUCTION, at the Greyhound Hotel, High Street, Croydon, on Wednesday, the 27th of April, 1892, at Six o'clock precisely, in 60 lots, *cum* Dividend, 285 SHARES (£5 fully paid), producing Dividends at the rate of 14 per cent. per annum, and 601 SHARES (£5 fully paid), producing Dividends at the rate of 11 per cent. per annum; all in the Capital of the Croydon Commercial Gas and Coke Company.

An excellent opportunity for the secure Investment of large or small amounts; the Dividends being well secured against fluctuation by ample Reserve and Insurance Funds.

Particulars and Conditions of Sale may be had of Messrs. STEPHENS AND STEPHENS, Solicitors, 29, Essex Street, STRAND, W.C.; at the place of SALE; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

MESSRS. Wheatley and Mackenzie beg to say that they have acquired the business of the late W. H. BENNETT, Esq., and that having a special experience in matters connected with Gas, Water, and Sanitary Improvement, will continue to give the same assistance to Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, or LETTERS PATENT.

Patents completed or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to WHEATLEY AND MACKENZIE, 40, Chancery Lane, LONDON, W.C.

THE Ballymena and Harryville Gaslight Company, Limited, invite TENDERS for from 150 to 1700 tons of Best Screened GAS COAL, free on wagons at Larne Harbour, to be delivered before the 1st of November next.

Payments to be made on the first Monday in March 1893.

Tenders to be lodged with me on or before Monday, April 11, at ten o'clock.

THOMAS HOOD,
Secretary.

Ballymena, April 1, 1892.

ALBO-CARBON LIGHT COMPANY, LIMITED.

FOR SALE
(To CLOSE A TRUST ESTATE)

TEN Shares of £50 each (£30 paid) of the above Company. Dividend for last Three years, 7½ per cent.

Apply to WEBSTER, WILL, AND RITCHIE, 37, Queen Street, EDINBURGH.

WEST HAM GAS COMPANY.

SALE OF 1150 SHARES.

MR. ALFRED RICHARDS is favoured with instructions from the Directors TO SELL BY AUCTION, at the Mart, E.C., on Thursday, April 21, at Two o'clock precisely, in Lots of ten Shares each, 1150 £10 SHARES in the West Ham Gas Company.

The Standard Dividend authorized by the Company's Act of Parliament is 7 per cent., subject to the usual Sliding Scale Clauses.

Particulars may be obtained at the MART; of the SECRETARY to the Company, STRATFORD, E.; of Messrs. HILLEARY, Solicitors, 5, FENCHURCH BUILDINGS, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

C. MEIKLEJOHN,
OLDBURY, BIRMINGHAM.
(Late N. MEIKLEJOHN, Longwood.)

AUG. KLÖNNE,
DORTMUND (GERMANY).

REGENERATIVE FURNACES.

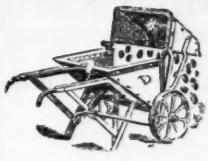
Unsurpassed in
Efficiency, Economy, Durability, and Easy Working.

ROSEWELL BOGHEAD.

Yield of Gas per ton . . . 13,215 Cub. Ft.
Illuminating Power . . . 37·56 Candles.

GAVIN PAUL & SONS,
CANNEL COALMASTERS,
EDINBURGH.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time labour, and expense.

For particulars, price &c., apply to Mr E. PRICE, Inventor and Patentee, 22, Alwyne Road Canonbury, LONDON, N.

Prices are Reduced.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,
(Established 1851,)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.
SCULCOATS, HULL.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
ADDRESS
JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

COKE BREAKERS.

G. R. Mather & Son, Engineers, Wellingboro'.

Now Ready. Price One Guinea.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.
1879-1890.

This Work is a continuation of that published in 1879 by the late Mr. G. W. Stevenson, which is still on sale, price One Guinea.

Now Ready. Price One Shilling.

METROPOLITAN WATER SUPPLY.
CONSIDERATIONS AFFECTING THE
ADEQUACY AND CONTROL
OF THE
WATER SUPPLY TO THE METROPOLIS.
BY
E. H. STEVENSON and E. K. BURSTAL, M.M.Inst.C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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LANEMARK CANNEL AND GAS COALS.

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STEEL OF ALL DESCRIPTIONS.

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T. B. KITTEL, SHEFFIELD.

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ENGLISH & SCOTCH CANNELS.

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ANALYSIS AND PRICES ON APPLICATION.

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CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

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COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

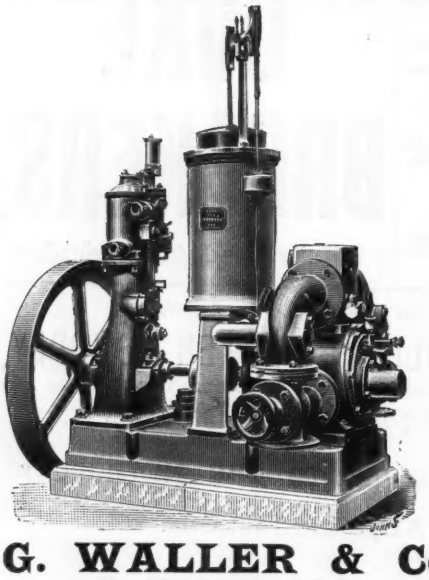
All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable; while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.



WALLER'S PATENT COMBINED GAS ENGINE AND EXHAUSTER

WITH

Disc-Valves, Automatic Bye-Pass Valve, Throttle-Valve, and Regulator,

COMPLETE ON ONE BASE PLATE.

Designed chiefly for sizes from 500 to 15,000 feet per hour.

EXHAUSTERS OF ANY SIZE

COMBINED WITH GAS-ENGINES (now made to vary in speed).

ENGINES & EXHAUSTERS RUN AT DIFFERENT SPEEDS

Waller's Washer-Scrubber with Wood Clusters.

ELEVATING AND CONVEYING MACHINERY FOR COAL, COKE, &c.

ILLUSTRATED CATALOGUE ON APPLICATION.

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GASHOLDERS

C. & W. WALKER

Have erected Gasholders of all dimensions, during the last 40 years, in all parts of Great Britain, and throughout the civilized world, for upwards of 500 Gas Companies and Municipalities; all of the best materials and highest class of workmanship.

They are now erecting a four-lift Holder of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

MIDLAND WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

AND

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GAS COAL. BEST REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

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NEW CONVEYOR COMPANY, LTD.

PLEASE WRITE FOR Catalogues.

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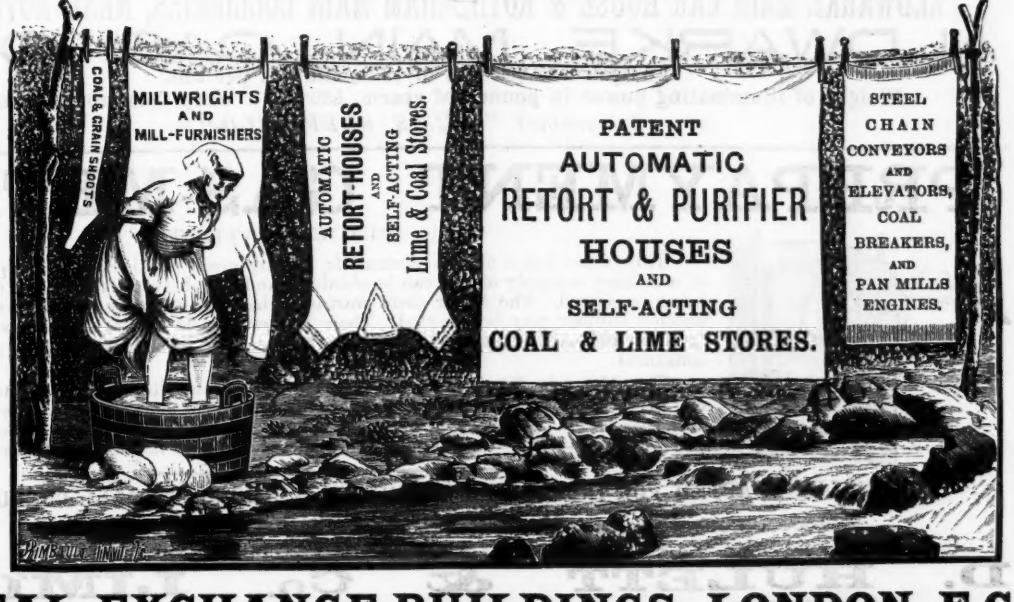
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AUTOMATIC RETORT-HOUSES AND SELF-ACTING Lime & Coal Stores.
PATENT AUTOMATIC RETORT & PURIFIER HOUSES AND SELF-ACTING COAL & LIME STORES.
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1, METAL EXCHANGE BUILDINGS, LONDON, E.C.

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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

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Cannel and Gas Coal Merchants,
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GLASGOW.

NEWBATTLE CANNEL.

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LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, the Ipswich Gas Company, and by many other Gas Companies both at Home and Abroad.

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HOLMSIDE AND SOUTH MOOR OFFICES,
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UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

"THE METEOR."
NEW HIGH-POWER GAS-LAMP.
Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,
SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,
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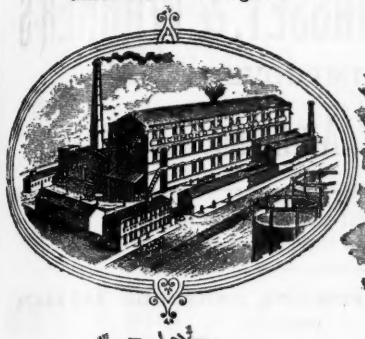

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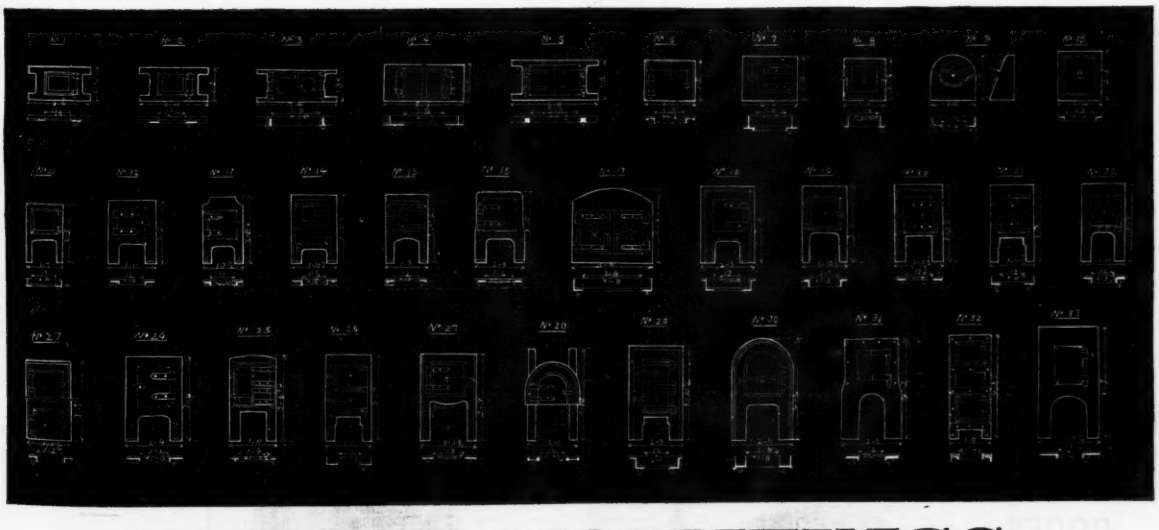

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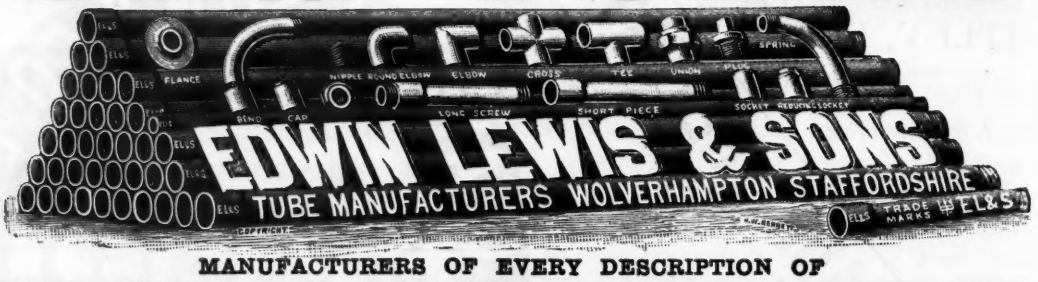

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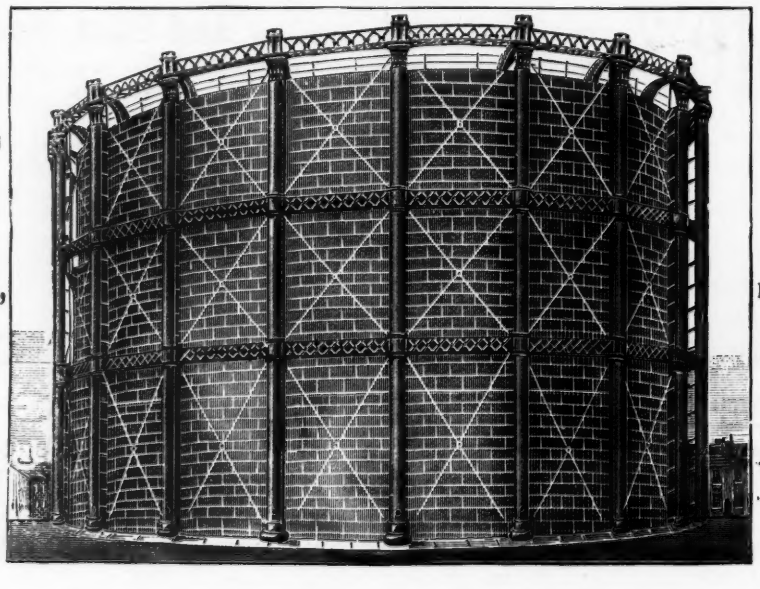

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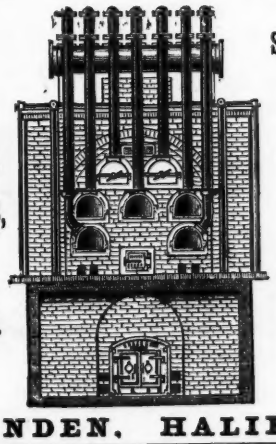

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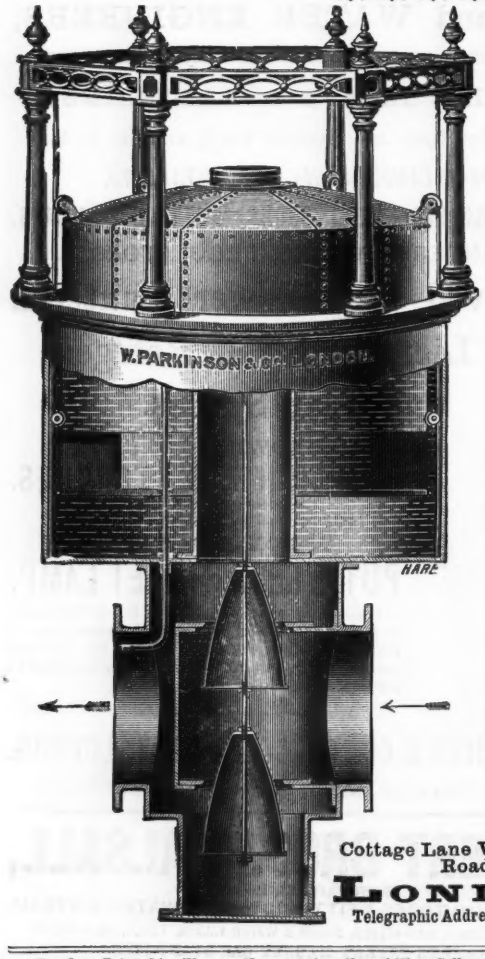

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